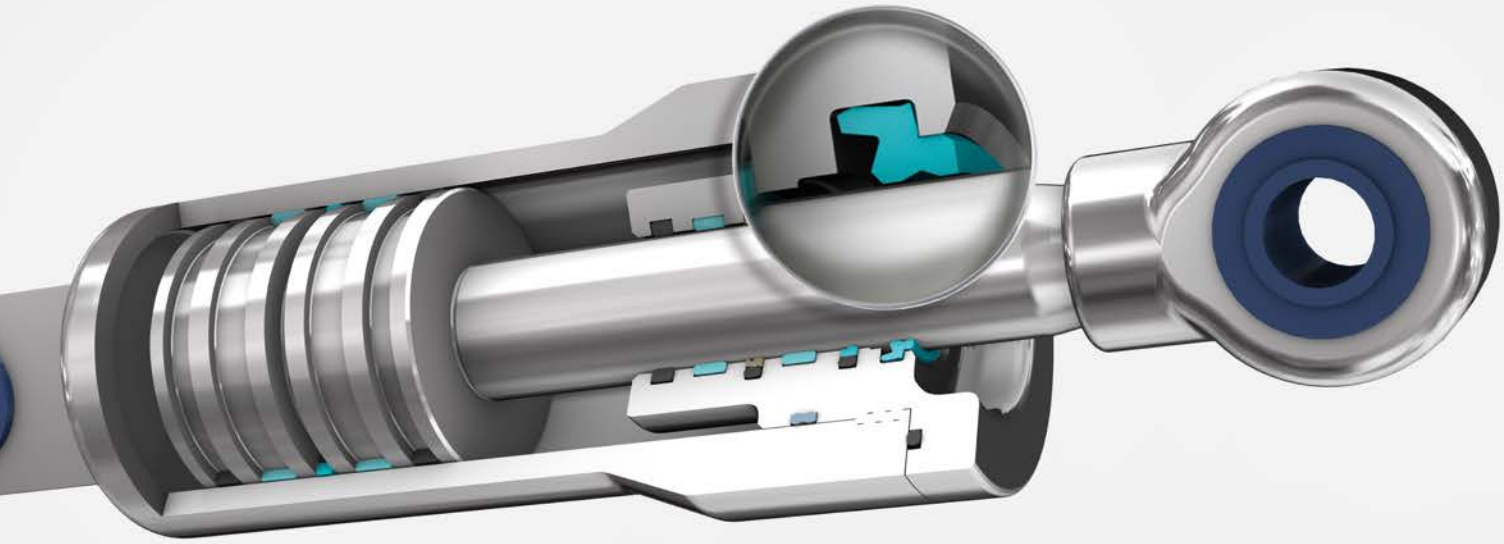
Scrapers



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Contents

■ Choice of Scraper Element

Scrapers are installed in hydraulic cylinders to wipe any dirt, foreign particles, chips, moisture, etc. from the piston rods as they are retracted into the system, thus preventing contamination of the hydraulic medium which would otherwise damage wear rings, seals and other components.

Single and double-acting scrapers can be used, depending on the application and the sealing system. They differ quite distinctly in their function: single-acting scrapers are designed to keep out contamination from the outside; double-acting scrapers have the additional function of optimising the sealing system and scraping off the existing residual fluid film, to avoid any external leakage.

In order to satisfy both the different technical and economic demands, there is a complete range of scrapers with optimised geometries made with high-quality materials.

Before selecting the scraper and the material, it is essential to know all the desired functional parameters. The table on following pages allows a preliminary choice of the scraper type and material, according to the specific requirements of the application.

Further general informations together with specific design and installation instructions for the particular scraper type and material can be found.

NOTE ON ORDERING

All multi-element standard scrapers are generally supplied as a complete set. The set includes scraper and energizing element. The O-Ring does not have to be ordered separately. It is also possible, however, to use other O-Ring materials from our O-Ring Catalogue. In this case, please order the scraper and O-Ring separately.

Older designs of scrapers no longer contained in this catalogue obviously continue to be available. When possible, however, for new applications we recommend the use of DIN/ISO series listed in the catalogue.

The sizes contained in this catalogue are generally available from stock and can be supplied at short notice. We reserve the right to modify our article structure without prior notice.

Please do not hesitate to contact your local Customer Solution Center for futher information on specific applications and special technical questions.

Table 145: Selection Criteria for Scrapers

Scraper		Application				Standard	Groove Type	Action		Size Range	Technical Data*		Recommended Scraper Material
		Field of Application									Temp. Range**	Speed	
Type	Page		Light	Medium	Heavy	ISO	mm	Single	Double	mm	°C	m/s	
Turcon® Excluder® 2 	441	Industrial hydraulics	•	•	•	6195 Type D	Split < 30 Closed > 30		•	4 - 2,600	-45/+200	15	M12
		Machine tools	•	•	•								
		Injection molding machines	•	•	•								T46
		Servo hydraulic cylinders	•	•	•								
		Robotics	•	•	•								
Turcon® Excluder® 5 	449	Heavy duty mobile and industrial hydraulics	•	•	•	6195 Type D	Split < 30 Closed > 30		•	20 - 2,600	-45/+200	15	M12
													T46
		Presses	•	•	•					20 - 2,200	-45/+110	2	Z54
		Steel mills	•	•	•								
Turcon® Excluder® Z 	457	Medium/Heavy duty mobile and industrial hydraulics	•	•	•	6195 Type D	Split < 25 Closed > 25		•	22 - 125	-45/+110	1	Z13
Turcon® Excluder® F 	465	Machine tools	•	•		-	Closed > 19		•	19 - 1,500	-45/+200	15	M12
		Automation	•	•									
		Valves	•	•									T46
		Small industrial hydraulics	•	•									
Turcon® Excluder® S 	475	Heavy hydraulics		•	•	-	Split		•	16 - 2,600	-45/+200	15	M12
		Offshore hydraulics		•	•								
		Water barriers		•	•								T46
											-45/+80	2	Z80/Z82
Turcon® Excluder® 1 and 113 	487	Industrial hydraulics	•	•		6195 Type D	Split < 30 Closed > 30	•		6 - 999.9	-45/+200	15	M12
		Machine tools	•	•									
		Servo hydraulics	•	•									T46
											-45/+110	2	Z54

* The data above are maximum values and cannot be used at the same time.
** Temperature Range depends on choice of elastomer material and media.

Table continues on next page

Scraper		Application				Standard	Groove Type	Action		Size Range	Technical Data*		Recommended Scraper Material
		Field of Application									Temp. Range**	Speed	
Type	Page		Light	Medium	Heavy	ISO	mm	Single	Double	mm	°C	m/s	
Scraper DA17 	497	Industrial hydraulics Machine tools Presses	• • •	• • •		-	Split < 18 Closed > 18		•	10 - 440	-25/+100	1	NBR
Zurcon® Scraper DA22 	503	ISO standard cylinder Industrial hydraulic cylinders	• •	• •	• •	6195 Type C	Split < 18 Closed > 18		•	5 - 180	-35/+100	1	Z201
Zurcon® Scraper DA24 & DA24 Venting Version 	509	Mobile hydraulics Construction machinery Agriculture machinery	• • •	• • •	• • •	-	Closed		•	45 - 290	-35/+100	1	Z201
Scraper WRM 	515	Agriculture machinery Handling equipment	• •	• •		-	Closed	•		12 - 260	-30/+110	1	NBR
Zurcon® Scraper ASW 	523	Agriculture machinery Mobile hydraulic machinery	• •	• •		-	Split < 14 Closed > 14	•		8 - 125	-35/+100	1	Z201

* The data above are maximum values and cannot be used at the same time.
** Temperature Range depends on choice of elastomer material and media.

Scraper		Application				Standard	Groove Type	Action		Size Range	Technical Data*		Recommended Scraper Material
		Field of Application									Temp. Range**	Speed	
Type	Page		Light	Medium	Heavy	ISO	mm	Single	Double	mm	°C	m/s	
Zurcon® Scraper WNV 	529	Agriculture machinery Mobile hydraulic machinery ISO standard cylinder Lift trucks Cargo tailboards Steering cylinders	• • • • • •	• • • • • •	• • • • • •	6195 Type A	Closed		•	16 - 100	-35/+100	1	Z201
Scraper WSA 	533	Agriculture machinery Standard hydraulic cylinder	• •	• •		-	Open	•		16 - 120	-30/+110	1	NBR + Metal
Zurcon® Scraper SWP 	539	Construction machinery Link pin seals		• •	• •	-	Open	•		25 - 190	-35/+100	1	Z201 + Metal
Metal Scraper 	545	Agriculture machinery Mobile hydraulic machinery ISO standard cylinder	• • •	• • •	• • •	-	Open	•		12 - 220	-30/+110	1	Metal + NBR + Brass
Turcon® Variseal® M2S 	551	Marine environments Subsea Application Hydraulics Low temperature / Cryogenic Chemical processing Food & Pharmaceutical	• • • • • •	• • • • • •	• • • • 	- - - - - -	Split or Stepped Housing	•		3 - 3,200	-50/+80 -50/+260 -196/+80 -50/+260 -50/+80 -50/+260	2 15 1 15 2 15	Z80 T40 Z80 T40 Z81 MF4

* The data above are maximum values and cannot be used at the same time.
** Temperature Range depends on choice of elastomer material and media.

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Turcon® Excluder® 2

Double-acting

Rubber-energized Double-acting scraper

Material:
Turcon®, Zurcon® and Elastomer

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■ Turcon® Excluder® 2*

■ Description

Turcon® Excluder® 2 is a patented double-acting scraper with scraper lip and sealing lip, positioned back-to-back. Excluder® 2 is always installed with an elastic O-Ring in one groove. The scraper function is performed by Excluder® 2. The O-Ring maintains the pressure of the scraper lips against the sliding surface and can compensate any deflections of the piston rod.

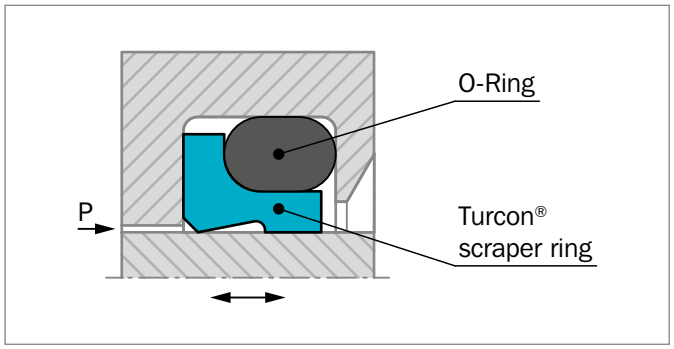

Figure 163: Turcon® Excluder® 2

Excluder® 2 has two functions:

- Scrape contaminants from the retracting piston rod to protect the system from soiling
- Hold back the residual oil film on the extending piston rod on the medium side.

Excluder® 2 is used in conjunction with our rod seals Turcon® Stepseal® 2K, Turcon® VL Seal® or Zurcon® Rimseal, i.e. seals with hydrodynamic back-pumping function.

ADVANTAGES

- Outstanding sliding properties
- Stick-slip-free, no sticking
- Can compensate for deflections of the piston rod
- Space-saving construction
- Very good scraping effect against outside contaminants, even with firmly adhered dirt, etc.
- Very good scraping effect from the inside against the residual oil film adhering to the surface of the piston rod
- Very high resistance to hydraulic media
- Available for all diameters up to 2,600 mm (Turcon®) and up to 2,200 mm (Zurcon® Z53/Z54)
- ISO 6195 Type D installation dimensions up to diameter 63 mm

OPERATING CONDITIONS

Speed:	Up to 15 m/s for Turcon® materials
	Up to 2 m/s for Zurcon® materials
Temperature:	-45 °C to +200 °C (Turcon®) -45 °C to +110 °C (Zurcon® Z53/Z54) -60 °C to +80 °C (Zurcon® Z80) (depending on O-Ring materials)
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on the O-Ring material compatibility.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

INSTALLATION INSTRUCTIONS

Excluder® 2 scrapers can be installed in split and closed grooves (installation dimensions, see Table 146). Installation in closed grooves depends on the rod diameter, profile cross-section of the scraper and on the cord cross-section of the corresponding O-Ring, see Table 148.

Table 146: Installation in Closed Grooves

Turcon® Excluder® 2 Series No.	Rod Diameter d_N	O-Ring Cross-Section d_2
WE30	> 30	1.78
WE31	> 30	2.62
WE32	> 40	3.53
WE33	> 50	5.33
WE34	> 110	7.00
WE35	> 140	8.40

* Patent application: EP 0 235 568 A2

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Excluder® 2 in Turcon® M12
All round material for light to medium hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
Set code:	M12N or M12V	

Turcon® Excluder® 2 in Turcon® T46
For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
Set code:	T46N or T46V	

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 147.

Table 147: Turcon® and Zurcon® Materials for Excluder® 2

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® M12 First material choice for linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on scrapers Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Steel plated Cast iron Stainless steel Titanium	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel Steel, chrome plated (rod) Cast iron Stainless steel Aluminum	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		

Table continous on next page

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel, hardened Steel, chrome plated (rod) Cast iron	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish More difficult to install Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel Steel, hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	2
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z54*** For mineral oil based fluids Linear and slowly turning movements High abrasion resistance For counter surface with rougher surface finish Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Cast iron Stainless steel Aluminum Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene)	Z80	NBR 70	N	-30 to (+100)	Steel Steel, chrome plated (rod) Stainless steel Aluminum Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to (+145)		

* The O-Ring operating temperatures are only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by “Bundesanstalt Materialprüfung, Germany”.

Highlighted materials are recommended.

■ Installation Recommendation

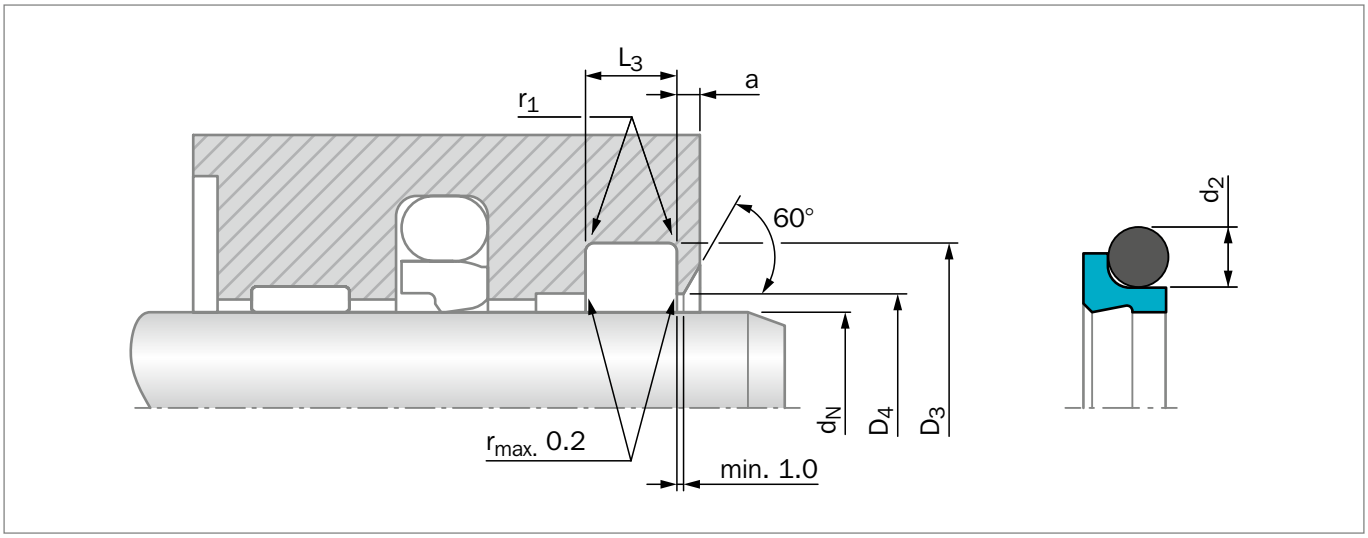

Figure 164: Installation Drawing

Table 148: Installation Dimension - Standard Recommendations

Series No.	Rod Diameter d_N f8/h9		Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
	Standard Application	Available Range	D_3 H9	L_3 +0.2/-0.0	D_4 H11	$a_{min.}$	$r_{1\ max}$	d_2
WE30	4 – 11.9	4 – 130	d_N + 4.8	3.7	d_N + 1.5	2.0	0.4	1.78
WE31	12 – 64.9	10 – 245	d_N + 6.8	5.0	d_N + 1.5	2.0	0.8	2.62
WE32	65 – 250.9	25 – 400	d_N + 8.8	6.0	d_N + 1.5	3.0	1.0	3.53
WE33	251 – 420.9	40 – 655	d_N + 12.2	8.4	d_N + 2.0	4.0	1.5	5.33
WE34	421 – 650.9	110 – 655	d_N + 16.0	11.0	d_N + 2.0	4.0	1.5	7.00
WE35	651 – 999.9	140 – 999.9	d_N + 20.0	14.0	d_N + 2.5	5.0	2.0	8.40
WE35X	1,000 - 2,600		d_N + 20.0	14.0	d_N + 2.5	5.0	2.0	8.40

For diameters d_N > 400 mm we recommend the use of Turcon® Excluder® 5.

ORDERING EXAMPLE

Turcon® Excluder® 2 complete with O-Ring, standard application:

Series:	WE31 from Table 148
Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WE3100500 from Table 149

Select the material from Table 147. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:

TSS Article No. WE31 0 0500 - M12 N

- TSS Series No.
- Type (Standard)
- Rod Diameter x 10*
- Quality Index (Standard)
- Material Code (Scraper)
- Material Code (O-Ring)

* For diameters $d_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: WE35 for diameter d_N = 1,200.0 mm
TSS Article No.: WE35**X1200**-M12N

Table 149: Installation Dimensions / TSS Part Numbers

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
4.0*	**8.8**	**3.7**	**WE3000040**	**5.60 x 1.80**
5.0*	**9.8**	**3.7**	**WE3000050**	**6.70 x 1.80**
6.0*	**10.8**	**3.7**	**WE3000060**	**7.65 x 1.78**
8.0*	**12.8**	**3.7**	**WE3000080**	**9.50 x 1.80**
10.0*	**14.8**	**3.7**	**WE3000100**	**11.8 x 1.80**
12.0*	**18.8**	**5.0**	**WE3100120**	**13.94 x 2.62**
14.0*	**20.8**	**5.0**	**WE3100140**	**15.54 x 2.62**
15.0	21.8	5.0	WE3100150	17.12 x 2.62
16.0	**20.8**	**3.7**	**WE3000160**	**17.17 x 1.78**
16.0*	**22.8**	**5.0**	**WE3100160**	**18.00 x 2.65**
17.8	24.6	5.0	WE3100178	20.29 x 2.65
18.0	**22.8**	**3.7**	**WE3000180**	**19.00 x 1.80**
18.0*	**24.8**	**5.0**	**WE3100180**	**20.29 x 2.62**
20.0	**24.8**	**3.7**	**WE3000200**	**21.95 x 1.78**
20.0*	**26.8**	**5.0**	**WE3100200**	**21.89 x 2.62**
22.0	**26.8**	**3.7**	**WE3000220**	**23.52 x 1.78**
22.0*	**28.8**	**5.0**	**WE3100220**	**23.47 x 2.62**
24.0	30.8	5.0	WE3100240	26.64 x 2.62
25.0*	**31.8**	**5.0**	**WE3100250**	**26.64 x 2.62**
28.0*	**34.8**	**5.0**	**WE3100280**	**29.82 x 2.62**
29.8	36.6	5.0	WE3100298	31.42 x 2.62
30.0	34.8	3.7	WE3000300	31.47 x 1.78
30.0	36.8	5.0	WE3100300	31.42 x 2.62
32.0*	**38.8**	**5.0**	**WE3100320**	**34.59 x 2.62**
33.0	37.8	3.7	WE3000330	34.65 x 1.78
34.8	41.6	5.0	WE3100348	36.17 x 2.62
35.0	39.8	3.7	WE3000350	34.65 x 1.78
35.0	41.8	5.0	WE3100350	36.17 x 2.62
36.0*	**42.8**	**5.0**	**WE3100360**	**37.77 x 2.62**
37.0	43.8	5.0	WE3100370	39.34 x 2.62
40.0*	**46.8**	**5.0**	**WE3100400**	**42.52 x 2.62**
42.0	48.8	5.0	WE3100420	44.12 x 2.62
42.8	49.6	5.0	WE3100428	44.12 x 2.62
44.0	48.8	3.7	WE3000440	44.17 x 1.78
45.0*	**49.8**	**3.7**	**WE3000450**	**47.35 x 1.78**
45.0	51.8	5.0	WE3100450	47.29 x 2.62
49.0	55.8	5.0	WE3100490	50.47 x 2.62
50.0*	**56.8**	**5.0**	**WE3100500**	**52.07 x 2.62**
50.0	**62.2**	**8.4**	**WE3300500**	**53.34 x 5.33**
54.0	60.8	5.0	WE3100540	55.25 x 2.62
55.0	61.8	5.0	WE3100550	56.82 x 2.62
56.0*	**62.8**	**5.0**	**WE3100560**	**58.42 x 2.62**
58.0	64.8	5.0	WE3100580	59.99 x 2.62
60.0	66.8	5.0	WE3100600	61.60 x 2.62
63.0*	**69.8**	**5.0**	**WE3100630**	**64.77 x 2.62**
65.0	73.8	6.0	WE3200650	66.27 x 3.53
70.0	**78.8**	**6.0**	**WE3200700**	**72.62 x 3.53**
73.0	81.8	6.0	WE3200730	75.79 x 3.53
75.0	83.8	6.0	WE3200750	75.79 x 3.53
80.0	**88.8**	**6.0**	**WE3200800**	**82.14 x 3.53**
81.0	89.8	6.0	WE3200810	82.14 x 3.53
85.0	93.8	6.0	WE3200850	85.32 x 3.53
86.0	94.8	6.0	WE3200860	88.49 x 3.53
88.0	96.8	6.0	WE3200880	88.49 x 3.53
90.0	**98.8**	**6.0**	**WE3200900**	**91.67 x 3.53**
95.0	103.8	6.0	WE3200950	98.02 x 3.53
100.0	**108.8**	**6.0**	**WE3201000**	**101.19 x 3.53**
105.0	113.8	6.0	WE3201050	107.54 x 3.53
110.0	**118.8**	**6.0**	**WE3201100**	**110.72 x 3.53**
115.0	123.8	6.0	WE3201150	117.07 x 3.53
120.0	128.8	6.0	WE3201200	120.24 x 3.53
125.0	**133.8**	**6.0**	**WE3201250**	**126.59 x 3.53**
130.0	138.8	6.0	WE3201300	132.94 x 3.53
135.0	143.8	6.0	WE3201350	136.12 x 3.53
137.0	145.8	6.0	WE3201370	139.29 x 3.53
140.0	**148.8**	**6.0**	**WE3201400**	**142.47 x 3.53**
145.0	153.8	6.0	WE3201450	145.64 x 3.53
150.0	158.8	6.0	WE3201500	151.99 x 3.53
150.0	162.2	8.4	WE3301500	151.77 x 5.33
160.0	**168.8**	**6.0**	**WE3201600**	**158.34 x 3.53**
170.0	178.8	6.0	WE3201700	171.04 x 3.53
180.0	**188.8**	**6.0**	**WE3201800**	**177.39 x 3.53**
190.0	198.8	6.0	WE3201900	190.09 x 3.53
200.0	**208.8**	**6.0**	**WE3202000**	**202.79 x 3.53**
210.0	218.8	6.0	WE3202100	209.14 x 3.53
220.0	**228.8**	**6.0**	**WE3202200**	**221.84 x 3.53**
230.0	238.8	6.0	WE3202300	228.19 x 3.53
240.0	248.8	6.0	WE3202400	240.89 x 3.53
250.0	**258.8**	**6.0**	**WE3202500**	**253.59 x 3.53**
260.0	272.2	8.4	WE3302600	253.37 x 5.33

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_3 H9	L_3 +0.2		
280.0	**292.2**	**8.4**	**WE3302800**	**278.77 x 5.33**
300.0	312.2	8.4	WE3303000	304.17 x 5.33
320.0	**332.2**	**8.4**	**WE3303200**	**329.57 x 5.33**
350.0	362.2	8.4	WE3303500	354.97 x 5.33
360.0	**372.2**	**8.4**	**WE3303600**	**354.97 x 5.33**
370.0	382.2	8.4	WE3303700	365.00 x 5.30
400.0	412.2	8.4	WE3304000	405.26 x 5.33
500.0	516.0	11.0	WE3405000	494.16 x 7.00
600.0	616.0	11.0	WE3406000	608.08 x 7.00
700.0	720.0	14.0	WE3507000	705 x 8.40
800.0	820.0	14.0	WE3508000	805 x 8.40
900.0	920.0	14.0	WE3509000	905 x 8.40
1,200.0	1,220.0	14.0	WE35X1200	1,205 x 8.40
1,800.0	1,820.0	14.0	WE35X1800	1,805 x 8.40
2,600.0	2,620.0	14.0	WE35X2600	2,605 x 8.40

The rod diameters in **bold** type comply with the recommendations of ISO 3,320.

* Installation in grooves according to ISO 6,195 Type D

Turcon® Excluder® 5

Double-acting

Rubber-energized Double-acting Scraper

Material:
Turcon®, Zurcon® and Elastomer

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■ Turcon® Excluder® 5*

■ Description

Turcon® Excluder® 5 is a patented double-acting scraper with scraper lip and sealing lip, positioned back-to-back. The scraper is installed with an O-Ring as elastic energizing element in one groove. The scraper function is performed by the Excluder® 5 Turcon® element. The O-Ring maintains the pressure of the scraper lips against the sliding surface and can compensate deflections of the piston rod.

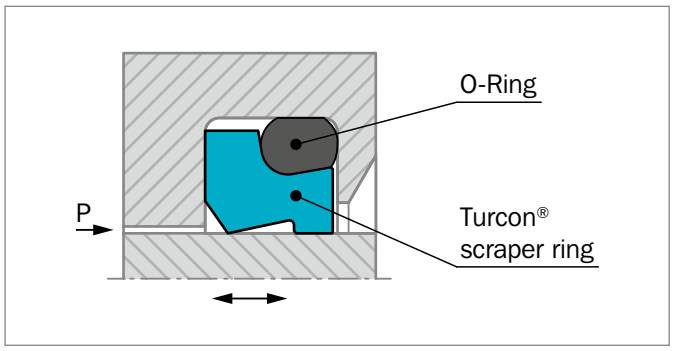


Figure 165: Turcon® Excluder® 5

Excluder® 5 has two functions:

- Scrape contaminants from the retracting piston rod to protect the system from soiling
- Hold back the residual oil film on the extending piston rod on the medium side.

Excluder® 5 is used in conjunction with our rod seals Turcon® Stepseal® 2K, Turcon® VL Seal® or Zurcon® Rimseal, i.e. seals with a hydrodynamic back-pumping function. In contrast to Excluder® 2, they are used particularly for heavy-duty applications such as in construction machinery, presses, etc.

ADVANTAGES

- Outstanding sliding properties
- Stick-slip-free, no sticking (Turcon® material)
- Tough scraper for heavy-duty operation
- Can compensate for deflections of the piston rod or plunger
- Very good scraping effect even against firmly adhered dirt, etc.
- Very good scraping effect from the inside against the residual oil film adhering to the surface of the piston rod
- Identical installation with that of the Zurcon® Excluder® 500
- Very high resistance to hydraulic media
- Available for all diameters up to 2,600 mm (Turcon®), up to 2,200 mm (Zurcon® Z53/Z54).
- ISO 6195 Type D installation dimensions from diameter 40 mm

OPERATING CONDITIONS

Speed:	Up to 15 m/s for Turcon® materials Up to 2 m/s for Zurcon® materials
Temperature:	-45 °C to +200 °C (Turcon®) -45 °C to +110 °C (Zurcon® Z53/Z54) -60 °C to +80 °C (Zurcon® Z80) depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on the scraper and O-Ring material compatibility.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

INSTALLATION INSTRUCTIONS

Excluder® 5 scrapers can be installed in split and closed grooves installation dimensions, see Table 150.

Installation in closed grooves depends on the rod diameter, profile cross-section of the scraper and on the cross section of the corresponding O-Ring, see Table 152.

Table 150: Installation in Closed Grooves

Turcon® Excluder® 5 Series No.	Rod Diameter d_N	O-Ring Cross Section d_2
WE50	> 30.0	2.62
WE51	> 40.0	2.62
WE52	> 70.0	3.53
WE53	> 100.0	5.33
WE54	> 140.0	7.00
WE55	> 180.0	8.40

* Patent application: EP 0 235 568 A2

RECOMMENDED MATERIALS

The following material combinations have proven effective for most applications:

Turcon® Excluder® 5 in Turcon® M12
All round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Excluder® 5 in Turcon® T46
For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 151.

Table 151: Turcon® and Zurcon® Materials for Excluder® 5

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® M12 First material choice for linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on scrapers Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Cast iron Stainless steel Titanium	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel Steel, chrome plated (rod) Cast iron Stainless steel Aluminum	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		

Table continues on next page

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel, hardened Steel, chrome plated (rod) Cast iron	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Linear and slowly turning movements Very high abrasion and extrusion resistance For counter surface with rougher surface finish More difficult to install Limited chemical resistance Max. working temperature 110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel Steel, hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	2
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z54*** For mineral oil based fluids High abrasion resistance For counter surface with rougher surface finish Good extrusion resistance Limited chemical resistance Max. working temperature 110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Cast iron Stainless steel Aluminum Ceramic coating	1
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene)	Z80	NBR 70	N	-30 to (+100)	Steel Steel, chrome plated (rod) Stainless steel Aluminum Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to (+145)		

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by “Bundesanstalt Materialprüfung, Germany”.

Highlighted materials are recommended.

■ Installation Recommendation

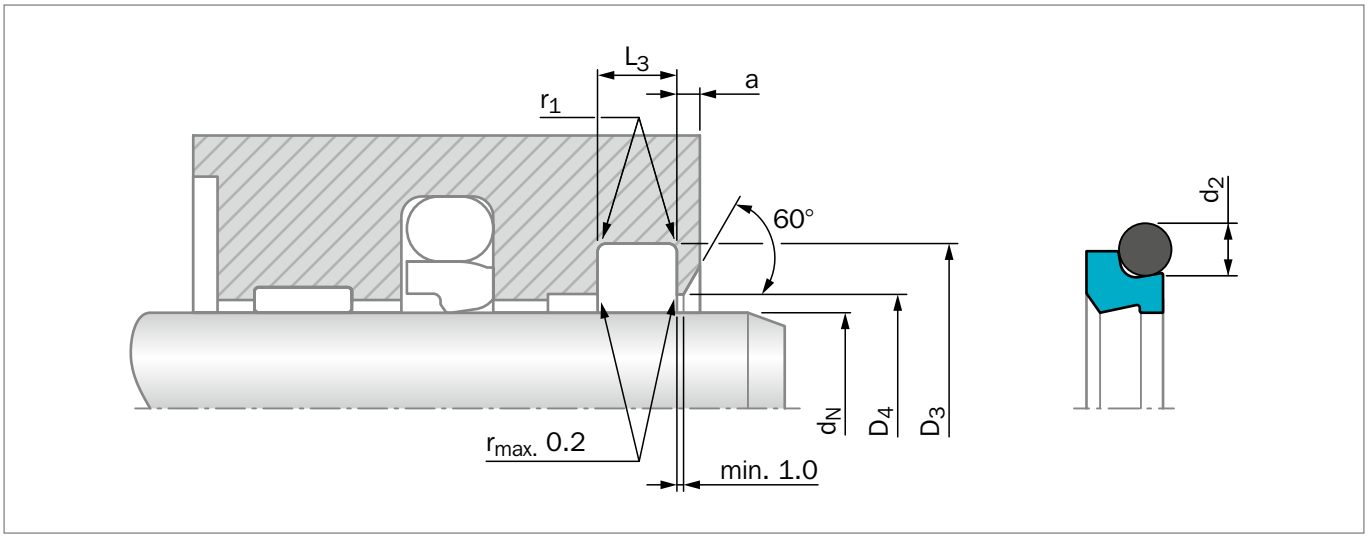


Figure 166: Installation Drawing

Table 152: Installation Dimensions – Standard Recommendations

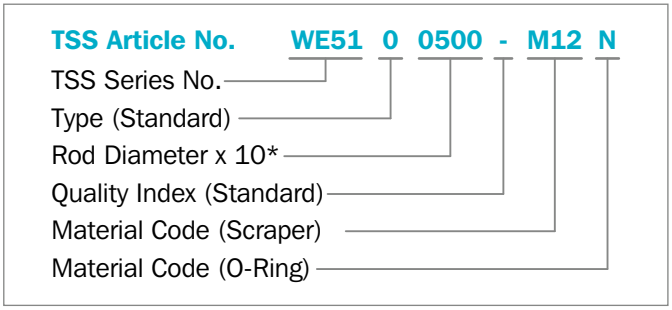
Series No.	Rod Diameter d_N f8/h9		Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
	Standard Application	Available Range	D_3 H9	L_3 +0.2/-0.0	D_4 H11	a_{min}	$r_{1\ max}$	d_2
WE50	19 – 39.9	19 – 100.0	d_N + 7.6	4.2	d_N + 1.5	3.0	0.8	2.62
WE51	40 – 69.9	30 – 200.0	d_N + 8.8	6.3	d_N + 1.5	3.0	1.0	2.62
WE52	70 – 139.9	50 – 360.0	d_N + 12.2	8.1	d_N + 2.0	4.0	1.0	3.53
WE53	140 – 399.9	100 – 650.0	d_N + 16.0	9.5	d_N + 2.5	5.0	1.5	5.33
WE54	400 – 649.9	200 – 650.0	d_N + 24.0	14.0	d_N + 2.5	8.0	1.5	7.00
WE55	650 – 999.9	400 – 999.9	d_N + 27.3	16.0	d_N + 2.5	10.0	2.0	8.40
WE55X	1,000 - 2,600		d_N + 27.3	16.0	d_N + 2.5	10.0	2.0	8.40

ORDERING EXAMPLE

Turcon® Excluder® 5 complete with O-Ring, standard application:

Series:	WE51 from Table 152
Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WE5100500 from Table 153

Select the material from Table 151. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



* For diameters $d_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: WE55 for diameter d_N = 1,200.0 mm
TSS Article No.: WE55**X1200**-M12N

Table 153: Installation Dimensions / TSS Part No.

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
19.0	26.6	4.2	WE5000190	21.89 x 2.62
20.0	**27.6**	**4.2**	**WE5000200**	**21.89 x 2.62**
22.0	**29.6**	**4.2**	**WE5000220**	**25.07 x 2.62**
25.0	**32.6**	**4.2**	**WE5000250**	**28.24 x 2.62**
28.0	**35.6**	**4.2**	**WE5000280**	**29.82 x 2.62**
30.0	37.6	4.2	WE5000300	32.99 x 2.62
32.0	**39.6**	**4.2**	**WE5000320**	**34.59 x 2.62**
35.0	42.6	4.2	WE5000350	37.77 x 2.62
36.0	**43.6**	**4.2**	**WE5000360**	**37.77 x 2.62**
40.0*	**48.8**	**6.3**	**WE5100400**	**44.12 x 2.62**
42.0	50.8	6.3	WE5100420	45.69 x 2.62
45.0*	**53.8**	**6.3**	**WE5100450**	**48.90 x 2.62**
48.0	56.8	6.3	WE5100480	52.07 x 2.62
50.0*	**58.8**	**6.3**	**WE5100500**	**53.64 x 2.62**
52.0	60.8	6.3	WE5100520	55.25 x 2.62
55.0	63.8	6.3	WE5100550	58.42 x 2.62
56.0*	**64.8**	**6.3**	**WE5100560**	**59.99 x 2.62**
60.0	67.6	4.2	WE5000600	63.17 x 2.62
60.0	68.8	6.3	WE5100600	63.17 x 2.62
63.0*	**71.8**	**6.3**	**WE5100630**	**66.34 x 2.62**
65.0	73.8	6.3	WE5100650	67.95 x 2.62
70.0*	**78.8**	**6.3**	**WE5100700**	**72.69 x 2.62**
70.0*	**82.2**	**8.1**	**WE5200700**	**75.79 x 3.53**
75.0	87.2	8.1	WE5200750	78.97 x 3.53
80.0*	**88.8**	**6.3**	**WE5100800**	**82.22 x 2.62**
80.0*	**92.2**	**8.1**	**WE5200800**	**85.32 x 3.53**
85.0	97.2	8.1	WE5200850	88.49 x 3.53
90.0*	**98.8**	**6.3**	**WE5100900**	**94.92 x 2.62**
90.0*	**102.2**	**8.1**	**WE5200900**	**94.84 x 3.53**
92.5	104.7	8.1	WE5200925	98.02 x 3.53
95.0	107.2	8.1	WE5200950	101.19 x 3.53
100.0*	**108.8**	**6.3**	**WE5101000**	**101.27 x 2.62**
100.0*	**112.2**	**8.1**	**WE5201000**	**104.37 x 3.53**
105.0	117.2	8.1	WE5201050	110.72 x 3.53
110.0*	**118.8**	**6.3**	**WE5101100**	**113.97 x 2.62**
110.0*	**122.2**	**8.1**	**WE5201100**	**113.89 x 3.53**
115.0	127.2	8.1	WE5201150	120.24 x 3.53
120.0	132.2	8.1	WE5201200	123.42 x 3.53
125.0*	**133.8**	**6.3**	**WE5101250**	**126.67 x 2.62**
125.0*	**137.2**	**8.1**	**WE5201250**	**129.77 x 3.53**

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
125.4	137.6	8.1	WE5201254	129.77 x 3.53
130.0	142.2	8.1	WE5201300	136.12 x 3.53
135.0	147.2	8.1	WE5201350	139.29 x 3.53
140.0*	**152.2**	**8.1**	**WE5201400**	**145.64 x 3.53**
140.0*	**156.0**	**9.5**	**WE5301400**	**145.42 x 5.33**
140.5	156.5	9.5	WE5301405	145.42 x 5.33
150.0	166.0	9.5	WE5301500	151.77 x 5.33
153.0	169.0	9.5	WE5301530	158.12 x 5.33
155.0	171.0	9.5	WE5301550	158.12 x 5.33
160.0*	**172.2**	**8.1**	**WE5201600**	**164.69 x 3.53**
160.0*	**176.0**	**9.5**	**WE5301600**	**164.47 x 5.33**
165.0	181.0	9.5	WE5301650	170.82 x 5.33
170.0	186.0	9.5	WE5301700	177.17 x 5.33
175.0	191.0	9.5	WE5301750	177.17 x 5.33
180.0*	**192.2**	**8.1**	**WE5201800**	**183.74 x 3.53**
180.0*	**196.0**	**9.5**	**WE5301800**	**183.52 x 5.33**
188.2	204.2	9.5	WE5301882	189.87 x 5.33
190.0	206.0	9.5	WE5301900	196.22 x 5.33
200.0*	**212.2**	**8.1**	**WE5202000**	**202.79 x 3.53**
200.0*	**216.0**	**9.5**	**WE5302000**	**202.57 x 5.33**
220.0*	**232.2**	**8.1**	**WE5202200**	**221.84 x 3.53**
220.0*	**236.0**	**9.5**	**WE5302200**	**221.62 x 5.33**
240.0	256.0	9.5	WE5302400	247.02 x 5.33
250.0*	**262.2**	**8.1**	**WE5202500**	**253.59 x 3.53**
250.0*	**266.0**	**9.5**	**WE5302500**	**253.37 x 5.33**
260.0	276.0	9.5	WE5302600	266.07 x 5.33
270.0	286.0	9.5	WE5302700	278.77 x 5.33
280.0*	**292.2**	**8.1**	**WE5202800**	**278.99 x 3.53**
280.0*	**296.0**	**9.5**	**WE5302800**	**278.77 x 5.33**
300.0	316.0	9.5	WE5303000	304.17 x 5.33
320.0*	**332.2**	**8.1**	**WE5203200**	**329.79 x 3.53**
320.0*	**336.0**	**9.5**	**WE5303200**	**329.57 x 5.33**
330.0	346.0	9.5	WE5303300	329.57 x 5.33
350.0	366.0	9.5	WE5303500	354.97 x 5.33
360.0*	**372.2**	**8.1**	**WE5203600**	**355.19 x 3.53**
360.0*	**376.0**	**9.5**	**WE5303600**	**365.00 x 5.30**
380.0	396.0	9.5	WE5303800	380.37 x 5.33
400.0	424.0	14.0	WE5404000	405.26 x 7.00
440.0	464.0	14.0	WE5404400	443.36 x 7.00
450.0	474.0	14.0	WE5404500	456.06 x 7.00

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_3 H9	L_3 +0.2		
480.0	504.0	14.0	WE5404800	481.38 x 7.00
500.0	524.0	14.0	WE5405000	506.86 x 7.00
560.0	584.0	14.0	WE5405600	557.66 x 7.00
600.0	624.0	14.0	WE5406000	608.08 x 7.00
650.0	677.3	16.0	WE5506500	662 x 8.40
680.0	707.3	16.0	WE5506800	692 x 8.40
700.0	727.3	16.0	WE5507000	712 x 8.40
750.0	777.3	16.0	WE5507500	762 x 8.40
800.0	827.3	16.0	WE5508000	812 x 8.40
850.0	877.3	16.0	WE5508500	862 x 8.40
900.0	927.3	16.0	WE5509000	912 x 8.40
950.0	977.3	16.0	WE5509500	962 x 8.40
1,000.0	1,027.3	16.0	WE55X1000	1,012 x 8.40
1,800.0	1,827.3	16.0	WE55X1800	1,812 x 8.40
2,600.0	2,627.3	16.0	WE55X2600	2,612 x 8.40

The rod diameters in **bold** type comply with the recommendations of ISO 3320.

* Installation in grooves according to ISO 6195 Type D

Zurcon® Excluder® Z

Injection Molded

Rubber-energized Double-acting Scraper

Material:
Zurcon® Z13 and Elastomer

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ZURCON® EXCLUDER® Z

Description

Zurcon® Excluder® Z is a new injection molded O-Ring energized double-acting scraper made from Zurcon® Z13 and fitting into 6195 type D grooves.

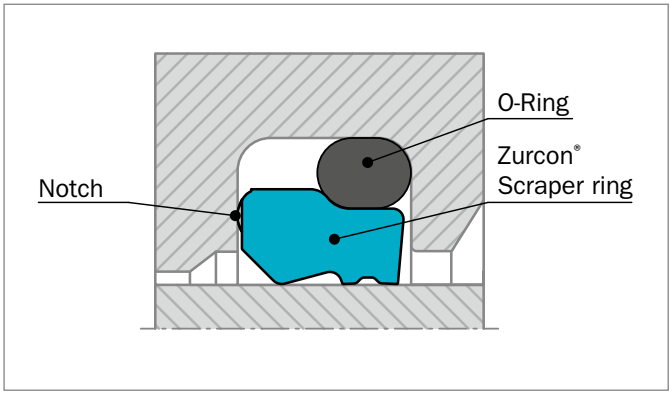


Figure 167: Zurcon® Excluder® Z

The seal has three areas, each performing a specific task: scraping, sealing and support lip (see Figure 169).

Dividing each portion of the profile into several sections, it was possible to optimize angles and the radius to achieve each function while maintaining the stability necessary to cope with different application conditions.

The O-Ring maintains the correct contact pressure on the lips and compensates for temperature conditions and rod deflection.

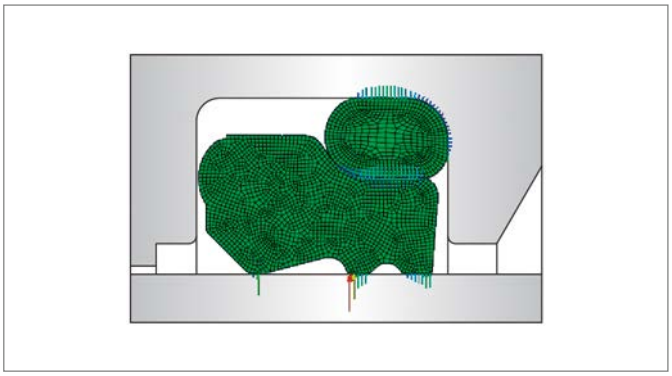


Figure 168: Contact pressure after assembly

Zurcon® Excluder® Z is designed to control fluid film during outstroke and instroke and is able to cope with hydraulic pressure coming from the system, provided it is used in combination with a primary or secondary seal with good back-pumping abilities like Zurcon® U-Cup RU9, Zurcon® L-Cup® or Zurcon® Rimseal.

Especially when used in tandem with a primary seal, this new design promises to give an effective solution for modern hydraulic applications.

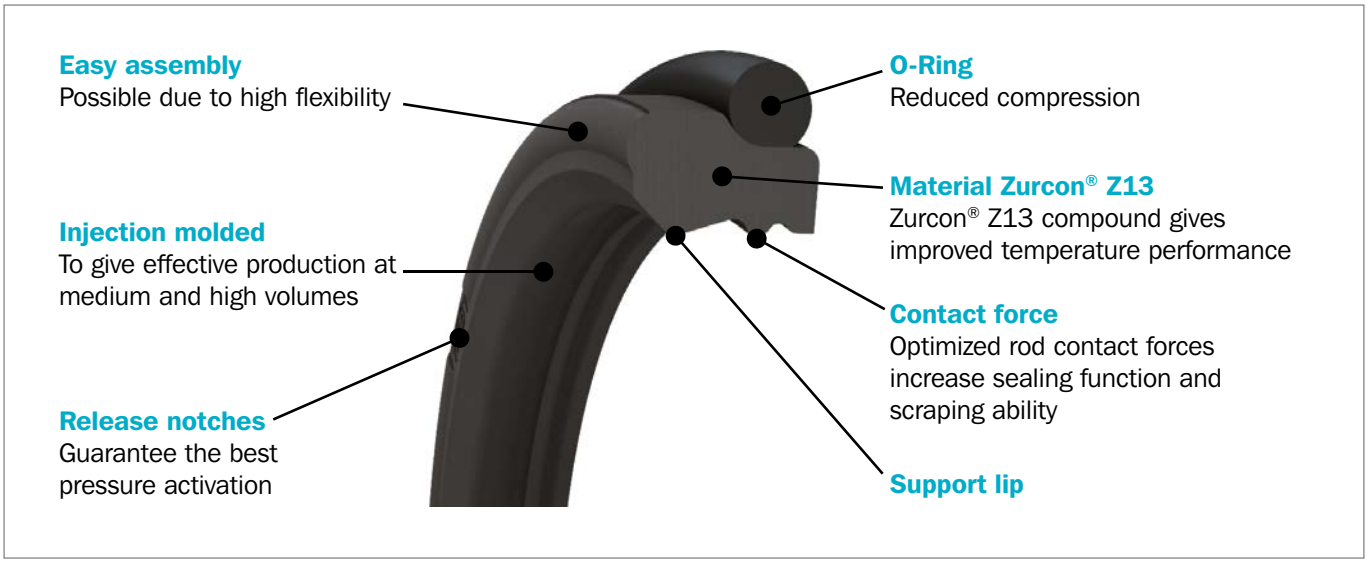
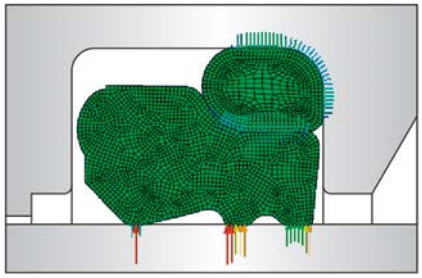


Figure 169: Zurcon® Excluder® Z design features

METHOD OF OPERATION

Notches guarantee optimal pressure activation of the O-Ring even with poor tolerance combinations of groove, seal and temperature. In order to improve performance throughout a wide range of application conditions, stability in the groove is of critical importance. Zurcon® Excluder® Z has a very stable design due to:

- Equal scraping, sealing and support on the inner diameter
- Lower O-Ring compression



In accordance with the optimum sealing technology specifications, Zurcon® Excluder® Z is designed to control fluid film during outstroke and instroke, due to the optimized shape of the scraping lip and improved production process.

ADVANTAGES

Zurcon® Excluder® Z has increased scraping and sealing capabilities from the optimized rod contact force distribution. Additionally, the compound also increases the temperature range up to +110 °C and greatly improves chemical compatibility with new generation hydraulic fluids.

Zurcon® Z13 is also available in injection molded tubes that allow machining of parts in low volumes and increases the diameter range above an injection machine's normal constraints.

Polyurethane materials have excellent abrasion resistance characteristics that guarantee a good scraping effect even in heavy-duty applications or when operating in harsh environments

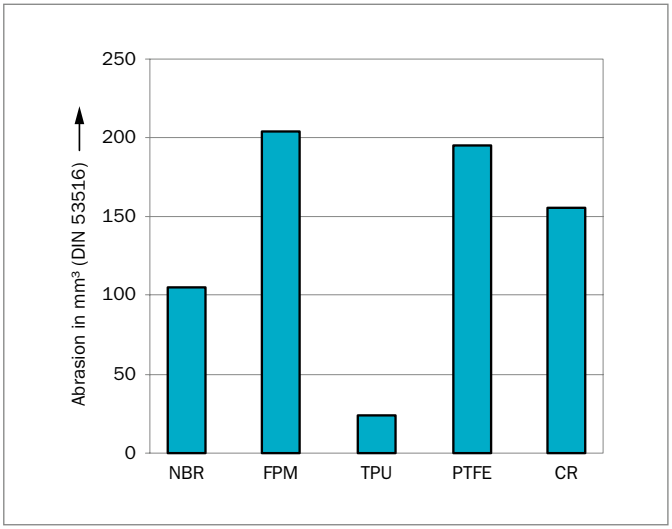


Figure 170: Comparison of abrasion resistance for different materials

Calibrated rod contact pressure and reduced friction when the oil film is controlled make Zurcon® Excluder® Z an excellent choice as a scraping element in Lubrication Management configurations.

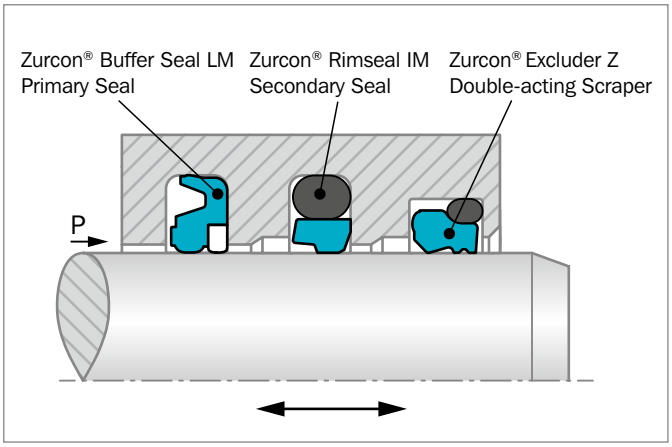


Figure 171: Tandem configuration

APPLICATION EXAMPLES

Excellent abrasion resistance and high activation force from the compressed O-Ring provide high scraping efficiency and compensate for any deflections of the piston rod in harsh environments. The closed groove installation protects the lip from damage. Zurcon® Excluder® Z is recommended for medium- and heavy-duty applications:

- Construction machinery
- Earth moving equipment
- Mobile hydraulics
- Machine tools
- Truck cranes
- Fork lifts

OPERATING CONDITIONS

Speed:	1 m/s
Temperature:	-45 °C to +110 °C depending on O-Ring material
Media:	Mineral oil, synthetic and natural esters, HEES/HETG up to +60 °C, flame retardant fluids HFA, special optimized for flame retardant fluids (HFC) up to +60 °C
Installation:	Standard mounting in closed grooves. For Ø < 25 mm request a split groove. No recalibration needed for installation in closed groove. ISO 6195 Type D installation dimensions from diameter 40 mm

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on pressure, temperature and gap value. A combination of pressure and speed might cause local heat increases, so care should be taken when evaluating high values for the above parameters simultaneously.

MATERIAL

Zurcon® Z13 is the 60 ShD TPU that combines excellent mechanical and elastic material properties:

- Temperature range from -45 ° to +110 °C
- (for short periods, up to +120°C)
- Good combination of elasticity and tensile strength
- Low friction
- Excellent chemical compatibility
- Low compression set at high temperatures

Table 154: Material Recommendation

Code	O-Ring Material Shore A	Code	O-Ring Temp. °C*
Z13	NBR 70	N	-30 to +100
	NBR 70 Low temp.	T	-45 to +80
	HNBR 70	H	-30 to +110
	FKM 70	V	-10 to (+200)

* The O-Ring operation temperature is only valid in hydraulic mineral oil.

Table 155: Z13 Chemical compatibility: General guideline (Laboratory compatibility tests 1,008 hours)

FLUIDS TYPE	DIN / ISO Code	Temperatur	Result
Mineral Oils	HLP HVLP HLPD	+110 °C	Excellent
Synthetics fluids	HEES	+80 °C to +100 °C	Excellent
	HEPG (PAG)	+60 °C	Good
	HEPR (PAO)	+100 °C	Excellent
Water based fluids	HFA	+60 °C to +60 °C	Good
	HFC	+60 °C	Excellent
Synthetics water free fluids	HFDU	+100 °C	Excellent

The above results must be considered as general guidelines. We recommend verifying the compound compatibility with the specific fluids and temperature conditions experienced in the application.

■ Installation Recommendation

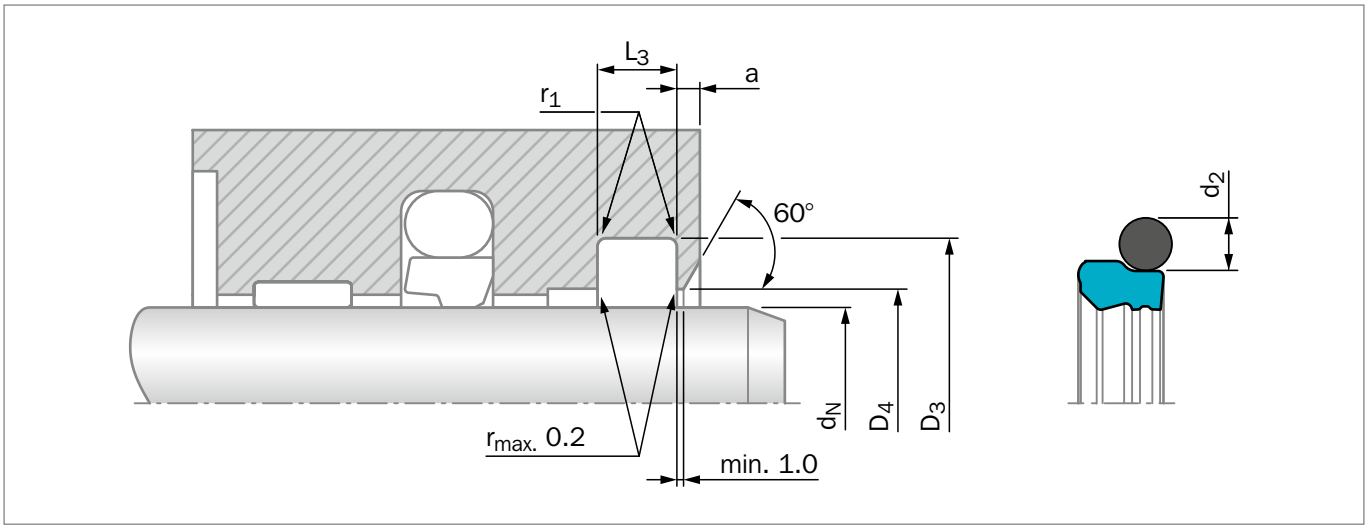


Figure 172: Installation Drawing

Table 156: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9		Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
	Standard Application	Available Range	D_3 H11	L_3 +0.2	D_4 H11	a_{min}	r_1 max	d_2
WEB0	19 – 39.9	19 – 100.0	d_N + 7.6	4.2	d_N + 1.5	3.0	0.8	2.62
WEB1	40 – 69.9	30 – 200.0	d_N + 8.8	6.3	d_N + 1.5	3.0	1.0	2.62
WEB2	70 – 139.9	70 – 360.0	d_N + 12.2	8.1	d_N + 2.0	4.0	1.0	3.53
WEB3	140 – 399.9*	100 – 399.9*	d_N + 16.0	9.5	d_N + 2.5	5.0	1.5	5.33

* max. diameter for Zurcon® Z13 injection molded tubes for machining is 423 mm OD

ORDERING EXAMPLE

Zurcon® Excluder Z complete with O-Ring:

Rod Diameter:	d_N = 50.0 mm
Groove Width:	L_1 = 6.3 mm
TSS Part No.:	WEB100500

TSS Article No. WEB1 0 0500 - Z13 N

- WEB1 — TSS Series No.
- 0 — Type (Standard)
- 0500 — Rod Diameter x 10
- Z13 — Quality Index (Standard), Material Code (Scraper)
- N — Material Code (O-Ring)

Table 157: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Radius	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_3 +0.2	D_4 H11		
22.0	**29.6**	**4.2**	**23.5**	**WEB000220**	**25.07 x 2.62**
25.0	**32.6**	**4.2**	**26.5**	**WEB000250**	**28.24 x 2.62**
28.0	**35.6**	**4.2**	**29.5**	**WEB000280**	**29.82 x 2.62**
30.0	37.6	4.2	31.5	WEB000300	32.99 x 2.62
35.0	42.6	4.2	36.5	WEB000350	37.77 x 2.62
***40.0**	**48.8**	**6.3**	**41.5**	**WEB100400**	**44.12 x 2.62**
***45.0**	**53.8**	**6.3**	**46.5**	**WEB100450**	**48.90 x 2.62**
***50.0**	**58.8**	**6.3**	**51.5**	**WEB100500**	**53.64 x 2.62**
60.0	68.8	6.3	61.5	WEB100600	63.17 x 2.62
65.0	73.8	6.3	66.5	WEB100650	67.95 x 2.62
***70.0**	**82.2**	**8.1**	**72.0**	**WEB200700**	**75.79 x 3.53**
***80.0**	**92.2**	**8.1**	**82.0**	**WEB200800**	**85.32 x 3.53**
85.0	97.2	8.1	87.0	WEB200850	88.49 x 3.53
***90.0**	**102.2**	**8.1**	**92.0**	**WEB200900**	**94.84 x 3.53**
95.0	107.2	8.1	97.0	WEB200950	101.19 x 3.53
***100.0**	**112.2**	**8.1**	**102.0**	**WEB201000**	**104.37 x 3.53**
105.0	117.2	8.1	107.0	WEB201050	110.72 x 3.53
***110.0**	**122.2**	**8.1**	**112.0**	**WEB201100**	**113.89 x 3.53**
***125.0**	**137.2**	**8.1**	**127.0**	**WEB201250**	**129.77 x 3.53**

All dimensions in **bold** type are in accordance with recommendations of ISO 3320

* installation in grooves according to ISO 6195 Type D

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Turcon® Excluder® F

Double-acting

Rubber-energized Double-acting Scraper

Material:
Turcon®, Zurcon® and Elastomer

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■ Turcon® Excluder® F

■ Description

Turcon® Excluder® F is a double-acting scraper with scraper lip and sealing lip, positioned back-to-back. The scraper is always installed with 2 O-Rings as elastic energizing elements in one groove. The scraper function itself is performed by the Excluder® F Turcon® element. The O-Rings maintains the pressure of the scraper lips against the sliding surface and compensates deflections of the piston rod.

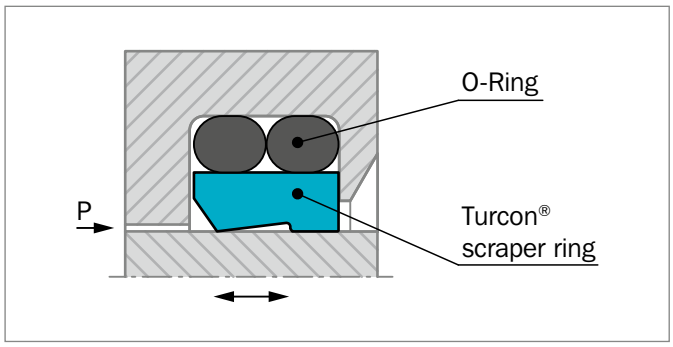

Figure 173: Turcon® Excluder® F

EXCLUDER® F HAS TWO FUNCTIONS:

- Scrape contaminants from the retracting piston rod to protect the system from soiling
- Hold back the residual oil film on the extending piston rod on the medium side.
- Excluder® F is preferably used in conjunction with our rod seals Turcon® Stepseal® 2K or Zurcon® Rimseal, i.e. seals with a hydrodynamic back-pumping function. Application wise the Excluder® F is placed between Excluder® 2 and Excluder® 5 for medium to ”light-heavy” duty such as in:
- Light construction machinery
- Truck crane
- Agriculture machines
- Hydraulic presses
- Injection molding machines
- Hydraulic actuators

ADVANTAGES

In principle the same as for Excluder® 2 and 5:

- Outstanding sliding properties
- Stick-slip-free, no sticking for Turcon® materials
- Tough scraper particular in Zurcon® materials
- Can compensate for deflections of the piston rod or plunger
- Very good scraping effect even against firmly adhered dirt, etc.
- Very good sealing effect from the inside against the residual oil film adhering to the surface of the piston rod
- Identical installation as Zurcon® Excluder® 500 and Excluder® 5 from WE50 to WE52
- Very high resistance to hydraulic media
- Available for diameters from 19 up to 1,500 mm
- ISO 6195 Type D installation on recommended diameters from 40 to 140 mm

DISADVANTAGES COMPARED TO EXCLUDER® 2 AND 5

- Require 2 pcs O-Rings
- Not completely axially locked in the groove
- More disposed to wrong installation

ADVANTAGES COMPARED TO EXCLUDER® 2 AND 5

- Easy installation in closed groove
- Improved radial flexibility
- Improved sealing function due to O-Ring arrangement

OPERATING CONDITIONS

Speed:	15 m/s for Turcon® materials 2 m/s for Zurcon® Z80 materials 1 m/s for Zurcon® Z53/Z54 materials
Temperature:	-45 °C to +200 °C (Turcon®) -60 °C to +80 °C (Zurcon® Z80) -45 °C to +110 °C (Zurcon® Z53/Z54) depending on O-Ring materials
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on scraper and O-ring material compatibility.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, environment, temperature and media.

INSTALLATION INSTRUCTIONS

All Excluder® F scrapers are preferably installed in closed grooves - installation dimensions see Table 159.

MATERIALS

The following material combinations have proven effective for most applications:

Turcon® Excluder® F in Turcon® M12
All round material for hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Excluder® F in Turcon® T46
For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 158.

Table 158: Turcon® and Zurcon® Materials for Excluder® F

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® M12 First material choice for linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on scrapers Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Steel plated (rod) Cast iron Stainless steel Titanium	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel Steel, chrome plated (rod) Cast iron Stainless steel Aluminum	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel, hardened Steel, chrome plated (rod) Cast iron	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Zurcon® Z53 For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish More difficult to install Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel Steel, hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	1
		NBR 70 Low temp.	T	-45 to +80		

Table continues on next page

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Zurcon® Z54 For mineral oil based fluids High abrasion resistance For counter surface with rougher surface finishes Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Turquoise	**Z54**	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Cast iron Stainless steel Aluminum Ceramic coating	1
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene)	**Z80**	NBR 70	N	-30 to +100	Steel Steel, chrome plated (rod) Stainless steel Aluminum Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to +145		

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil, except EPDM.

** Material not suitable for mineral oils.

BAM: Tested by “Bundesanstalt Materialprüfung, Germany”.

Highlighted materials are recommended.

Installation Recommendation

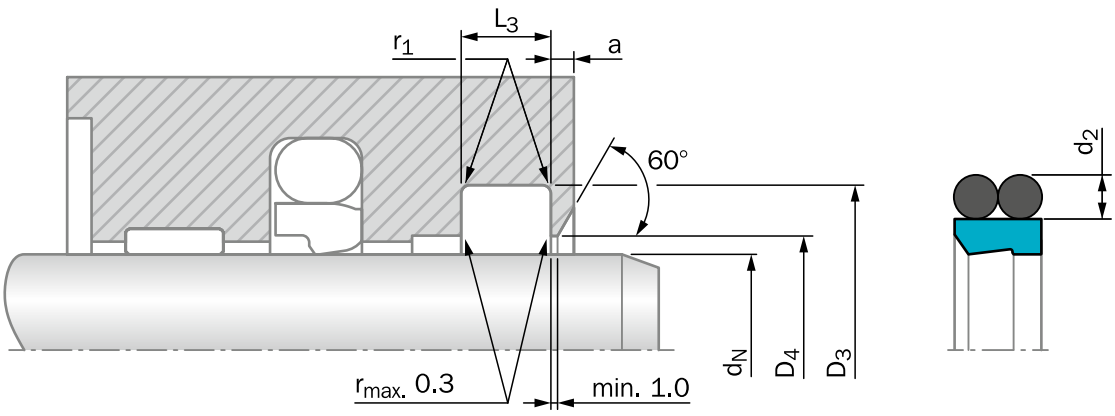

Figure 174: Installation Drawing

Table 159: Installation Dimensions – Standard Recommendations

Series No.	Rod d_N f8/h9		Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
	Standard Application	Available Range	D_3 H9	L_3 +0.2	D_4 H11	a_{min}	$r_{1\ max}$	d_2
WEF0	19 - 39.9	19 - 130	d_N + 7.6	4.2	d + 1.0	3.0	0.4	1.78
WEF1	40 - 69.9	30 - 250	d_N + 8.8	6.3	d + 1.5	3.0	1.0	2.62
WEF2	70 - 139.9	50 - 450	d_N + 12.2	8.1	d + 2.0	5.0	1.2	3.53
WEF3	140 - 399.9	80 - 650	d_N + 16.0	11.5	d + 2.0	5.0	2.0	5.33
WEF4	400 - 649.9	180 - 650	d_N + 24.0	15.5	d + 2.5	8.0	2.5	7.00
WEF5	650 - 999.9	300 - 999.9	d_N + 27.3	18.0	d + 2.5	10.0	2.5	8.40
WEF5X	1,000 - 1,500		d_N + 27.3	18.0	d + 2.5	10.0	2.5	8.40

ORDERING EXAMPLE

Turcon® Excluder® F complete with O-Ring, standard application:

Series:	WEF1 from Table 159
Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WEF100500 from Table 160

Select the material from Table 158. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:

TSS Article No. **WEF1 0 0500 - M12 N**

- WEF1 — Series No.
- 0 — Type (Standard)
- 0500 — Rod Diameter x 10*
- - — Quality Index (Standard)
- M12 — Material Code (Scraper)
- N — Material Code (O-Ring)

* For diameters $d_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: WEF5 for diameter d_N = 1,200.0 mm
TSS Article No.: WEF5**X1200**-M12N

Table 160: Installation Dimensions / TSS Part Numbers

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
19.0	26.6	4.2	WEF000190	23.52 x 1.78
20.0	**27.6**	**4.2**	**WEF000200**	**23.52 x 1.78**
22.0	**29.6**	**4.2**	**WEF000220**	**26.70 x 1.78**
25.0	**32.6**	**4.2**	**WEF000250**	**28.30 x 1.78**
28.0	**35.6**	**4.2**	**WEF000280**	**31.47 x 1.78**
30.0	37.6	4.2	WEF000300	34.65 x 1.78
32.0	**39.6**	**4.2**	**WEF000320**	**34.65 x 1.78**
35.0	42.6	4.2	WEF000350	37.82 x 1.78
36.0	**43.6**	**4.2**	**WEF000360**	**41.00 x 1.78**
40.0*	**48.8**	**6.3**	**WEF100400**	**44.12 x 2.62**
42.0	50.8	6.3	WEF100420	45.69 x 2.62
45.0*	**53.8**	**6.3**	**WEF100450**	**48.90 x 2.62**
48.0	56.8	6.3	WEF100480	52.07 x 2.62
50.0*	**58.8**	**6.3**	**WEF100500**	**53.64 x 2.62**
52.0	60.8	6.3	WEF100520	55.25 x 2.62
55.0	63.8	6.3	WEF100550	58.42 x 2.62
56.0*	**64.8**	**6.3**	**WEF100560**	**59.99 x 2.62**
60.0	67.6	4.2	WEF000600	63.22 x 1.78
60.0	68.8	6.3	WEF100600	63.17 x 2.62
63.0*	**71.8**	**6.3**	**WEF100630**	**66.34 x 2.62**
65.0	73.8	6.3	WEF100650	67.95 x 2.62
70.0*	**78.8**	**6.3**	**WEF100700**	**72.69 x 2.62**
70.0*	**82.2**	**8.1**	**WEF200700**	**75.79 x 3.53**
75.0	87.2	8.1	WEF200750	78.97 x 3.53
80.0*	**88.8**	**6.3**	**WEF100800**	**82.22 x 2.62**
80.0*	**92.2**	**8.1**	**WEF200800**	**85.32 x 3.53**
85.0	97.2	8.1	WEF200850	88.49 x 3.53
90.0*	**98.8**	**6.3**	**WEF100900**	**94.92 x 2.62**
90.0*	**102.2**	**8.1**	**WEF200900**	**94.84 x 3.53**
92.5	104.7	8.1	WEF200925	98.02 x 3.53
95.0	107.2	8.1	WEF200950	101.19 x 3.53
100.0*	**108.8**	**6.3**	**WEF101000**	**101.27 x 2.62**
100.0*	**112.2**	**8.1**	**WEF201000**	**104.37 x 3.53**
105.0	117.2	8.1	WEF201050	110.72 x 3.53
110.0*	**118.8**	**6.3**	**WEF101100**	**113.97 x 2.62**
110.0*	**122.2**	**8.1**	**WEF201100**	**113.89 x 3.53**
115.0	127.2	8.1	WEF201150	120.24 x 3.53
120.0	132.2	8.1	WEF201200	123.42 x 3.53
125.0*	**133.8**	**6.3**	**WEF101250**	**126.67 x 2.62**
125.0*	**137.2**	**8.1**	**WEF201250**	**129.77 x 3.53**

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
125.4	137.6	8.1	WEF201254	129.77 x 3.53
130.0	142.2	8.1	WEF201300	136.12 x 3.53
135.0	147.2	8.1	WEF201350	139.29 x 3.53
140.0*	**152.2**	**8.1**	**WEF201400**	**145.64 x 3.53**
140.0*	**156.0**	**11.5**	**WEF301400**	**145.42 x 5.33**
140.5	156.5	11.5	WEF301405	145.42 x 5.33
150.0	166.0	11.5	WEF301500	151.77 x 5.33
153.0	169.0	11.5	WEF301530	158.12 x 5.33
155.0	171.0	11.5	WEF301550	158.12 x 5.33
160.0*	**172.2**	**8.1**	**WEF201600**	**164.69 x 3.53**
160.0*	**176.0**	**11.5**	**WEF301600**	**164.47 x 5.33**
165.0	181.0	11.5	WEF301650	170.82 x 5.33
170.0	186.0	11.5	WEF301700	177.17 x 5.33
175.0	191.0	11.5	WEF301750	177.17 x 5.33
180.0*	**192.2**	**8.1**	**WEF201800**	**183.74 x 3.53**
180.0*	**196.0**	**11.5**	**WEF301800**	**183.52 x 5.33**
188.2	204.2	11.5	WEF301882	189.87 x 5.33
190.0	206.0	11.5	WEF301900	196.22 x 5.33
200.0*	**212.2**	**8.1**	**WEF202000**	**202.79 x 3.53**
200.0*	**216.0**	**11.5**	**WEF302000**	**202.57 x 5.33**
220.0*	**232.2**	**8.1**	**WEF202200**	**221.84 x 3.53**
220.0*	**236.0**	**11.5**	**WEF302200**	**221.62 x 5.33**
240.0	256.0	11.5	WEF302400	247.02 x 5.33
250.0*	**262.2**	**8.1**	**WEF202500**	**253.59 x 3.53**
250.0*	**266.0**	**11.5**	**WEF302500**	**253.37 x 5.33**
260.0	276.0	11.5	WEF302600	266.07 x 5.33
270.0	286.0	11.5	WEF302700	278.77 x 5.33
280.0*	**292.2**	**8.1**	**WEF202800**	**278.99 x 3.53**
280.0*	**296.0**	**11.5**	**WEF302800**	**278.77 x 5.33**
300.0	316.0	11.5	WEF303000	304.17 x 5.33
320.0*	**332.2**	**8.1**	**WEF203200**	**329.79 x 3.53**
320.0*	**336.0**	**11.5**	**WEF303200**	**329.57 x 5.33**
330.0	346.0	11.5	WEF303300	329.57 x 5.33
350.0	366.0	11.5	WEF303500	354.97 x 5.33
360.0*	**372.2**	**8.1**	**WEF203600**	**355.19 x 3.53**
360.0*	**376.0**	**11.5**	**WEF303600**	**365.00 x 5.30**
380.0	396.0	11.5	WEF303800	380.37 x 5.33
400.0	424.0	15.5	WEF404000	405.26 x 7.00
440.0	464.0	15.5	WEF404400	443.36 x 7.00
450.0	474.0	15.5	WEF404500	456.06 x 7.00

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_3 H9	L_3 +0.2		
480.0	504.0	15.5	WEF404800	481.38 x 7.00
500.0	524.0	15.5	WEF405000	506.86 x 7.00
550.0	574.0	15.5	WEF405500	557.66 x 7.00
600.0	624.0	15.5	WEF406000	608.08 x 7.00
650.0	677.3	18.0	WEF506500	662 x 8.40
700.0	727.3	18.0	WEF507000	712 x 8.40
750.0	777.3	18.0	WEF507500	762 x 8.40
800.0	827.3	18.0	WEF508000	812 x 8.40
900.0	927.3	18.0	WEF509000	912 x 8.40
1,000.0	1,027.3	18.0	WEF5X1000	1,012 x 8.40
1,100.0	1,127.3	18.0	WEF5X1100	1,112 x 8.40
1,200.0	1,227.3	18.0	WEF5X1200	1,212 x 8.40

The rod diameters in **bold** type comply with the recommendations of ISO 3320.

* Installation in grooves according to ISO 6195 Type D

Other dimensions and all intermediate sizes up to 1,500 mm diameter including imperial (inch) sizes can be supplied upon request.

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Turcon® Excluder® S

Double-acting

Rubber-energized Double-acting Scraper

Material:
Turcon®, Zurcon®, Elastomer and Metal

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■ Turcon® Excluder® S

■ Description

Turcon® Excluder® S is a double-acting scraper with scraper lip and sealing lip, positioned back-to-back. Excluder® S element is as standard always installed with a metal V-Spring and an O-Ring.

The V-Spring in the external part maintains a permanent pressure on the scraping edge. The internal O-Ring activates the sealing lip.

The V-Spring is filled with high temperature silicone to prevent contamination blocking the spring.

The conical front guides contamination away from the reciprocating rod. This is especially important when the piston rod is pointing upwards.

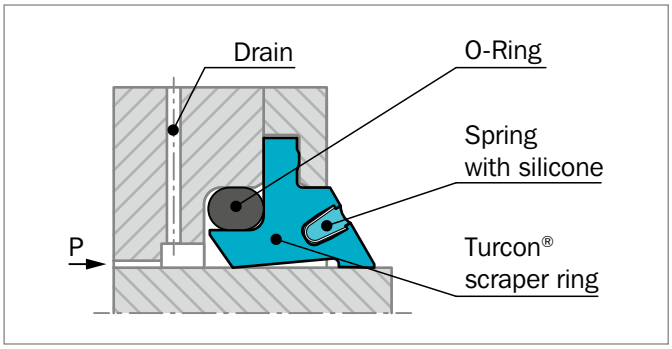


Figure 175: Turcon® Excluder® S with V-Spring activated lip

EXCLUDER® S HAS TWO FUNCTIONS:

- Scrape contaminants from the retracting piston rod protecting the system from soiling
- Hold back the residual fluid film on the extending piston rod at the fluid side.

APPLICATIONS

Excluder® S is preferably used in very dirty environments where it is mandatory to prevent moisture and contaminants from being trapped in front of the scraper element e.g. when the rod is pointing upwards, typically for bigger rod diameters in applications like:

- Mining equipment
- Hydraulic presses
- Steelworks
- Heavy construction machinery
- Marine constructions
- Offshore installations
- Water works

ADVANTAGES

- No dirt trapping because of spring activated conical scraping lip
- Outstanding sliding properties
- Stick-slip-free, no sticking (for Turcon® materials)
- Good scraping effect even against firmly adhered dirt, etc.
- Good sealing effect from the inside against the residual fluid film adhering to the surface of the piston rod
- Clamped installation prevents particles and moisture to pass between Excluder® and cylinder head
- Very high resistance to hydraulic media
- Available for diameters from 40 up to 2,600 mm (Turcon®), up to 2,200 mm (Zurcon® Z53/Z54), up to 1,000 mm (Zurcon® Z82)

OPERATING CONDITIONS

Movement:	Linear respectively low speed rotary service
Back-Pressure:	Up to 1.5 MPa drain line between rod seals and Excluder® is recommended
Speed linear:	15 m/s for Turcon® materials 2 m/s for Zurcon® Z80/Z82 materials 1 m/s for Zurcon® Z53/Z54 materials
Temperature:	-45 °C to +200 °C (Turcon®) -45 °C to +110 °C (Zurcon® Z53 / Z54) -60 °C to +80 °C (Zurcon® Z80/Z82) depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on scraper ring and O-Ring material compatibility.

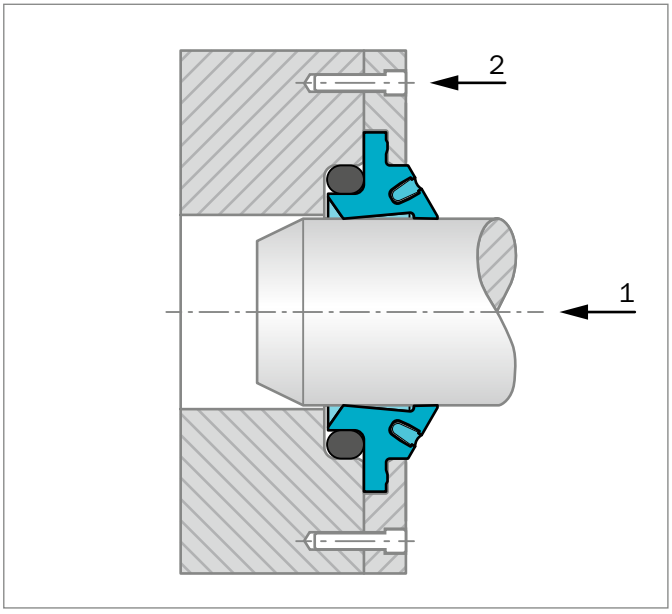


Figure 176: Installation and calibration of the Turcon® Excluder® S by the rod or a calibration mandrel

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

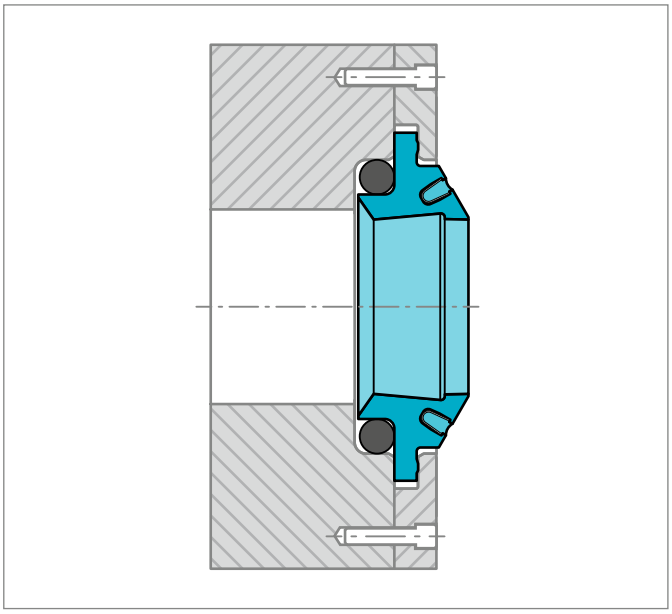


Figure 177: Turcon® Excluder® S installed in split groove

INSTALLATION INSTRUCTIONS

Excluder® S is always installed in split housing grooves.

Housing dimensions, radial clearances and recommended Excluder® S series in relation to diameter are as illustrated in Table 162.

Installation should be performed in the following steps in order to ensure a concentric and stress-free fit:

- Insert the O-Ring in the groove
- Place the Excluder® Ring into the open groove
- Fit the cover loosely onto the housing
- Insert the rod - check whether rod has the recommended lead-in chamfer; if not, use a calibration mandrel - see Figure 176 **point 1**
- Tighten the cover - see Figure 176 **point 2**

RECOMMENDED MATERIALS

The following material combination has proven effective for most applications:

Excluder® S in Turcon® M12
All round material for hydraulic applications with reciprocating, short stroke or helical movements in mineral oils, phosphate ester, bio-oils or fluids having less satisfactory lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	EPDM 70 Shore A	E
	(depending on medium and temperature)	
Set code:	M12N, M12V or M12E	

Excluder® S in Turcon® T46
For medium to heavy duty applications with reciprocating movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	(depending on medium and temperature)	
Set code:	T46N or T46V	

Excluder® S in Zurcon® Z80/Z82
For lubricating and non-lubricating fluids including water, air and gases:

O-Ring:	NBR 70 Shore A	N
	EPDM 70 Shore A	E
	(depending on medium and temperature)	
Set code:	Z80N or Z80E	

Other available material combinations are listed in Table 161.

For specific applications, all Turcon® materials are available.

Table 161: Turcon® and Zurcon® Materials for Excluder® S

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® M12 First material choice for linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on Excluder® Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome-plated (rod) Cast iron Stainless steel Titanium	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Turcon® T40 For lubricating and non-lubricating fluids Linear and rotary motion High frequency and short strokes Water hydraulics Surface texture not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel Steel, chrome-plated (rod) Cast iron Stainless steel Aluminum Bronze Alloys	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel (tubes) Steel, hardened Steel, chrome-plated (rod) Cast iron	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Linear and slowly turning movement Very high abrasion and extrusion resistance For counter surface with rougher surface finish More difficult to install Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel Steel, hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	1
		NBR 70 Low temp.	T	-45 to +80		

Table continues on next page

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Zurcon® Z54*** For mineral oil based fluids Linear and slowly turning movements High abrasion resistance For counter surface with rougher surface finishes Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome-plated (rod) Cast iron Stainless steel Aluminum Bronze Alloys Ceramic coating	1
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics Linear and slowly turning movements High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) Not resistant to UV-light (sunlight), use Z82 instead UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off white	Z80	NBR 70	N	-30 to (+100)	Steel Steel, chrome-plated (rod) Stainless steel Aluminum Bronze Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to (+145)		
Zurcon® Z82 Same as Z80 but resistant to UV-light (sunlight) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: Black	Z82	NBR 70	N	-30 to (+100)	Steel Steel, chrome-plated (rod) Stainless steel Aluminum Bronze Ceramic coating	2
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to (+145)		

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil, except EPDM.

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by “Bundesanstalt Materialprüfung, Germany”.

Highlighted materials are recommended.

■ Installation Recommendation

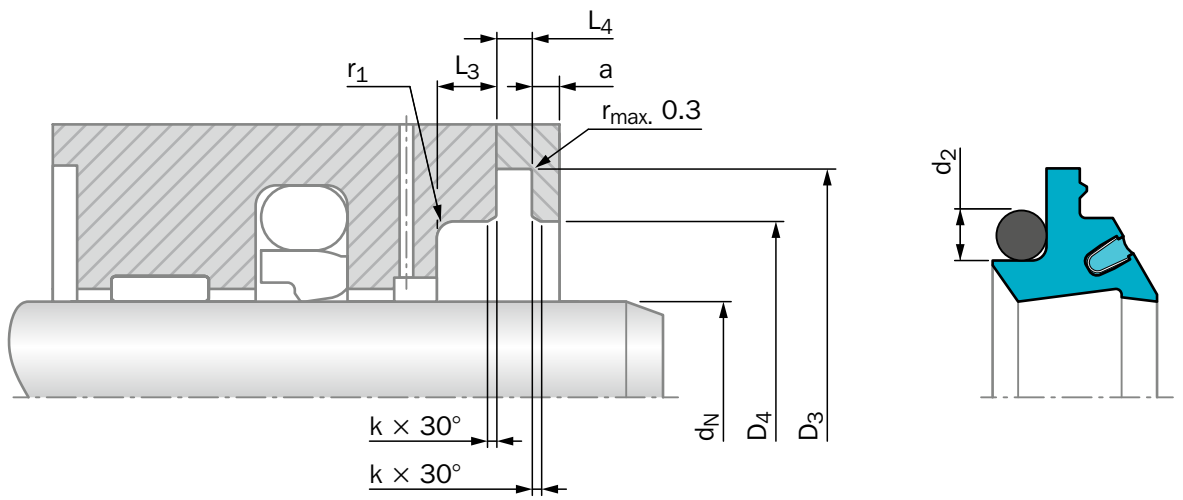


Figure 178: Installation Drawing

Table 162: Installation Dimensions

Series No.	Rod Diameter d_N f8/h9		Groove Diameter	Groove Width	Groove Width	Groove Diameter	Radius	Step Width	Inlet Chamfer	O-Ring Cross Section
	Standard Application	Available Range	D_3 H10	L_4 ±0.08	L_3 +0.2/-0.0	D_4 H9	r_1 max	a +0.0/-0.1	k	d_2
WES0	16 – 49.9	16 – 90	d_N + 12.0	1.80	2.20	d_N + 7.3	0.5	1.2	0.5	1.78
WES2	50 – 349.9	40 - 800	d_N + 18.7	2.50	4.20	d_N + 11.3	1.2	2.0	0.7	3.53
WES3	350 - 799.9	100 - 999.9	d_N + 28.0	4.00	6.30	d_N + 17.0	1.8	3.0	1.0	5.33
WES4	800 - 999.9	250 - 999.9	d_N + 33.0	4.50	8.25	d_N + 21.0	2.2	4.5	1.2	7.00
WES4X	1,000 – 2,600		d_N + 33.0	4.50	8.25	d_N + 21.0	2.2	4.5	1.2	7.00

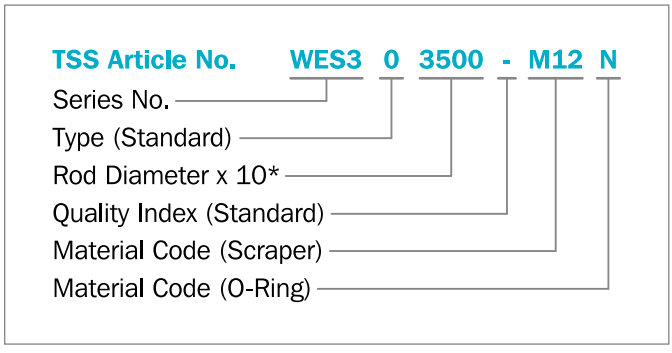
WES1 Series are not available

ORDERING EXAMPLE

Excluder® S with V-Spring complete with O-Ring, standard application:

Series:	WES3 from Table 162
Rod Diameter:	d_N = 350.0 mm
TSS Part No.:	WES303500 from Table 163

Select the material from Table 161. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article No. for all intermediate sizes can be determined by following the example:



* For diameters $d_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: WES4 for diameter d_N = 1,200.0 mm
TSS Article No.: WES4**X1200**-M12N

Table 163: Installation Dimensions / TSS Part No.

Rod Dia. d_N f8/h9	Groove Dia. D_3 H10	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
16.0	**28.0**	**2.20**	**WES000160**	**19.00 x 1.80**
18.0	**30.0**	**2.20**	**WES000180**	**21.95 x 1.78**
20.0	**32.0**	**2.20**	**WES000200**	**23.52 x 1.78**
22.0	**34.0**	**2.20**	**WES000220**	**25.12 x 1.78**
25.0	**37.0**	**2.20**	**WES000250**	**28.30 x 1.78**
28.0	**40.0**	**2.20**	**WES000280**	**31.47 x 1.78**
30.0	42.0	2.20	WES000300	33.05 x 1.78
32.0	**44.0**	**2.20**	**WES000320**	**34.65 x 1.78**
36.0	**48.0**	**2.20**	**WES000360**	**37.82 x 1.78**
40.0	**52.0**	**2.20**	**WES000400**	**44.17 x 1.78**
45.0	**57.0**	**2.20**	**WES000450**	**47.35 x 1.78**
50.0	**68.7**	**4.20**	**WES200500**	**53.57 x 3.53**
56.0	**74.7**	**4.20**	**WES200560**	**59.92 x 3.53**
63.0	**81.7**	**4.20**	**WES200630**	**66.27 x 3.53**
70.0	**88.7**	**4.20**	**WES200700**	**72.62 x 3.53**
80.0	**98.7**	**4.20**	**WES200800**	**82.14 x 3.53**
90.0	**108.7**	**4.20**	**WES200900**	**94.84 x 3.53**
100.0	**118.7**	**4.20**	**WES201000**	**104.37 x 3.53**
110.0	**128.7**	**4.20**	**WES201100**	**113.89 x 3.53**
120.0	138.7	4.20	WES201200	123.42 x 3.53
125.0	**143.7**	**4.20**	**WES201250**	**129.77 x 3.53**
130.0	148.7	4.20	WES201300	132.94 x 3.53
140.0	**158.7**	**4.20**	**WES201400**	**142.47 x 3.53**
150.0	168.7	4.20	WES201500	151.99 x 3.53
160.0	**178.7**	**4.20**	**WES201600**	**164.69 x 3.53**
170.0	188.7	4.20	WES201700	171.04 x 3.53
180.0	**198.7**	**4.20**	**WES201800**	**183.74 x 3.53**
190.0	208.7	4.20	WES201900	190.09 x 3.53
200.0	**218.7**	**4.20**	**WES202000**	**202.79 x 3.53**
210.0	228.7	4.20	WES202100	209.14 x 3.53
220.0	**238.7**	**4.20**	**WES202200**	**221.84 x 3.53**
230.0	248.7	4.20	WES202300	234.54 x 3.53
240.0	258.7	4.20	WES202400	240.89 x 3.53
250.0	**268.7**	**4.20**	**WES202500**	**253.59 x 3.53**
280.0	**298.7**	**4.20**	**WES202800**	**278.99 x 3.53**
300.0	318.7	4.20	WES203000	304.39 x 3.53
320.0	**338.7**	**4.20**	**WES203200**	**304.39 x 3.53**
350.0	378.0	6.30	WES303500	354.97 x 5.33
360.0	**388.0**	**6.30**	**WES303600**	**365.00 x 5.30**
380.0	408.0	6.30	WES303800	380.37 x 5.33
400.0	428.0	6.30	WES304000	405.26 x 5.33
420.0	448.0	6.30	WES304200	405.26 x 5.33
440.0	468.0	6.30	WES304400	430.66 x 5.33
450.0	478.0	6.30	WES304500	456.06 x 5.33
480.0	508.0	6.30	WES304800	481.38 x 5.33
500.0	528.0	6.30	WES305000	506.78 x 5.33
550.0	578.0	6.30	WES305500	532.18 x 5.33
600.0	628.0	6.30	WES306000	582.68 x 5.33
650.0	678.0	6.30	WES306500	633.48 x 5.33
680.0	708.0	6.30	WES306800	658.88 x 5.33
700.0	728.0	6.30	WES307000	658.88 x 5.33
750.0	778.0	6.30	WES307500	658.88 x 5.33
800.0	833.0	8.25	WES408000	809 x 7.00
850.0	883.0	8.25	WES408500	859 x 7.00
900.0	933.0	8.25	WES409000	909 x 7.00
950.0	983.0	8.25	WES409500	959 x 7.00
1,000.0	1,033.0	8.25	WES4X1000	1,009 x 7.00
1,200.0	1,233.0	8.25	WES4X1200	1,209 x 7.00
1,500.0	1,533.0	8.25	WES4X1500	1,509 x 7.00
1,800.0	1,833.0	8.25	WES4X1800	1,809 x 7.00
2,000.0	2,033.0	8.25	WES4X2000	2,009 x 7.00
2,200.0	2,233.0	8.25	WES4X2200	2,209 x 7.00
2,600.0	2,633.0	8.25	WES4X2600	2,609 x 7.00

The rod diameters in **bold** type comply with the recommendations of ISO 3320

■ Optional Designs

Turcon® Excluder® SN
Optional, Turcon® Excluder® SN - Figure 179 the internal sealing lip has axial notch for applications where pressure trapping behind Excluder® S exceeds the allowed 1.5 MPa and a drain line not applicable.

The axial notch will lead the pressure to the scraping lip, which is lifted and relieving the pressure. This version is only delivered on TSS Standard Part Number with V-Spring Excluder® lip activation.

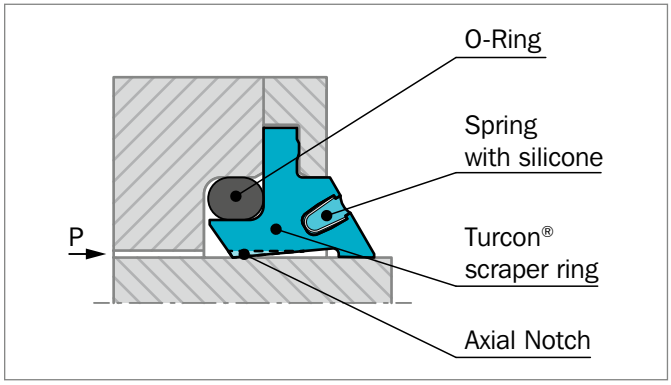


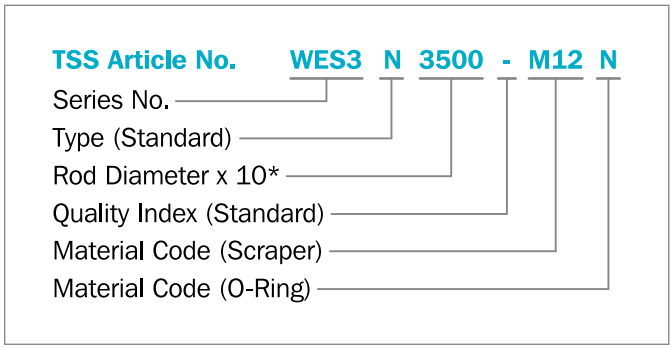
Figure 179: Optional Turcon® Excluder® SN where internal sealing lip has axial notch.

ORDERING EXAMPLE

Optional Excluder® SN with V-Spring and Notch on internal sealing lip, complete with O-Ring, standard application:

Series:	WES3N from Table 162
Rod Diameter:	d_N = 350.0 mm
TSS Part No.:	WES3N3500 from Table 163

Select the material from Table 161. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article No. for all intermediate sizes can be determined by following the example:



* For diameters $d_N \geq 1{,}000$ mm WES_N is available on TSS Special Article No.

Turcon® Excluder® SR
Optional Turcon® Excluder® SR - Figure 180 - with 2 O-Rings as elastic energizing elements.
The V-Spring is exchanged with an O-Ring for applications with less demanding service and situations where conditions or regulations eliminate applying metal V-Spring with silicone.

When Installing Excluder® SR with O-Ring scraper lip activation the O-Ring is mounted into the lip before the Excluder® Ring is placed in the groove.

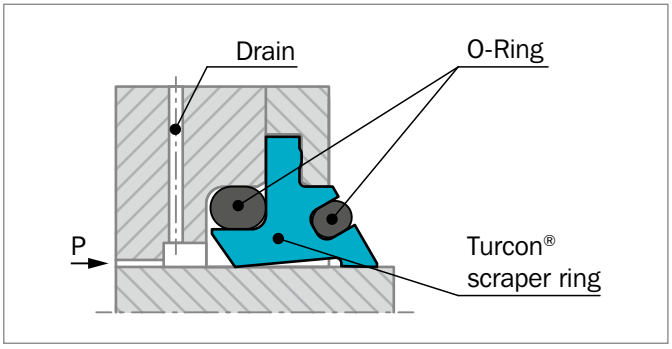


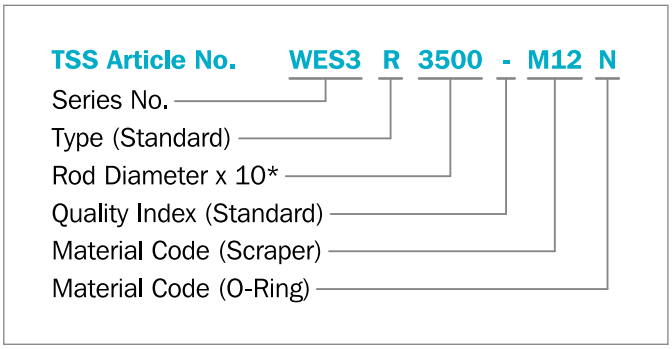
Figure 180: Optional Turcon® Excluder® SR with O-Ring activated Excluder® lip

ORDERING EXAMPLE

Turcon® Excluder® SR complete with O-Rings, standard application:

Series:	WES3R from Table 162
Rod Diameter:	d_N = 350.0 mm
TSS Part No.:	WES3R3500 from Table 163

Select the material from Table 161. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article No. for all intermediate sizes can be determined by following the example:



* For diameters $d_N \geq 1{,}000$ mm WES_R is available on TSS Special Article No.

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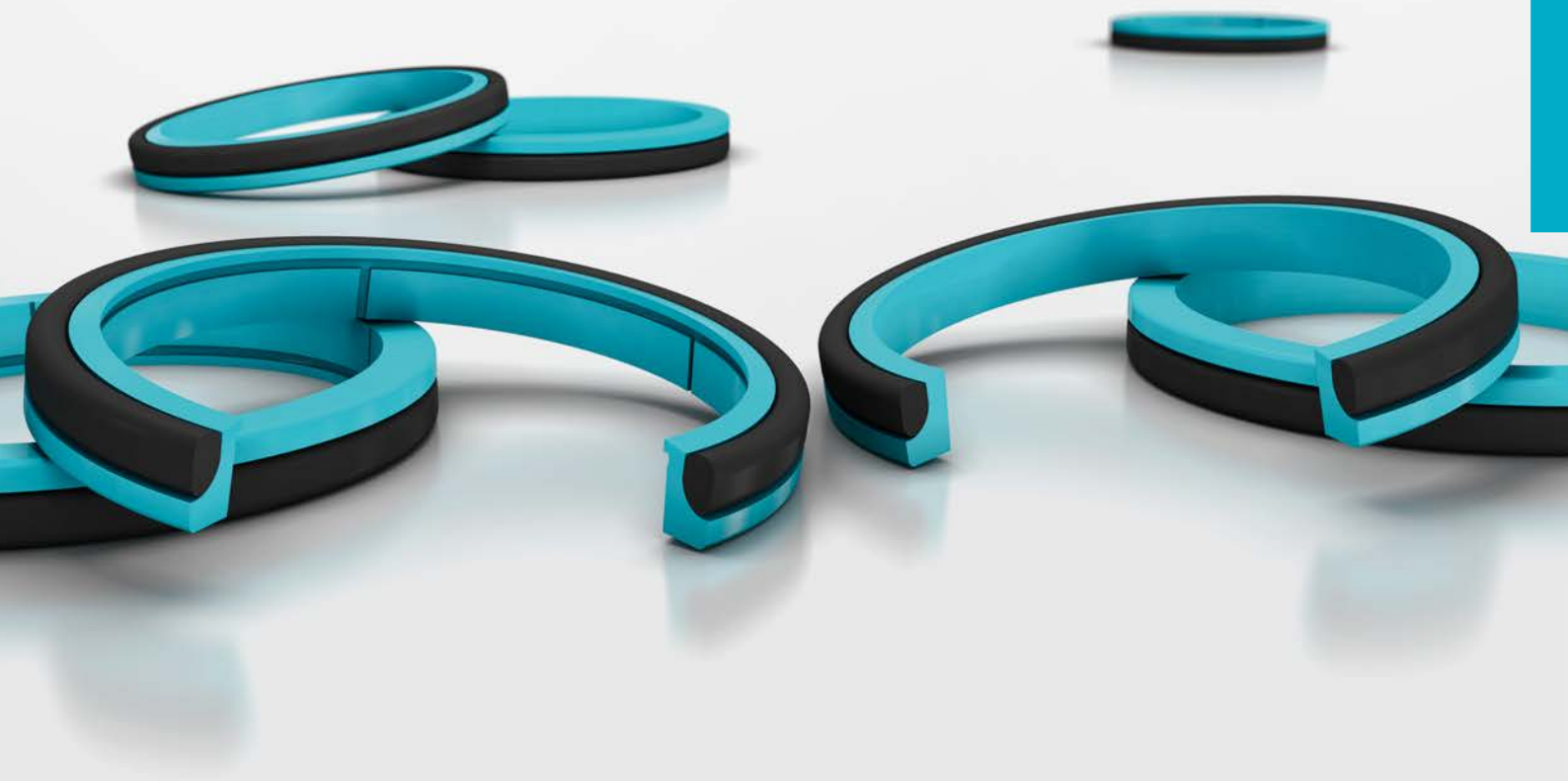
Turcon® Excluder® 1 and Excluder® 113

Single-acting

Rubber-energized Single-acting Scraper

Material:
Turcon®, Zurcon® and Elastomer



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■ Turcon® Excluder® 1

■ Description

Turcon® Excluder® 1 is the classic single acting scraper both for rough, delicate, hot or cold environments. It consists of two components, a scraper ring and a flexible elastomer O-Ring which ensures a tight contact with surface to be scraped. The O-Ring also functions as static seal between the opposite side of the scraper ring and the groove bottom.

APPLICATIONS

Excluder® 1 can be installed in a variety of rod sealing systems with linear movements.

A single acting scraper requires a very tight sealing system for minimising the fluid film, which will pass the scraper as leakage, and to prevent pressure activation, which can disturb the scraping function.

Produced in hard Turcon® or Zurcon® materials, the robust Excluder® 1 is able to scrape off difficult and persistent impurities such as dust, dirt, solid particles, ice, etc.

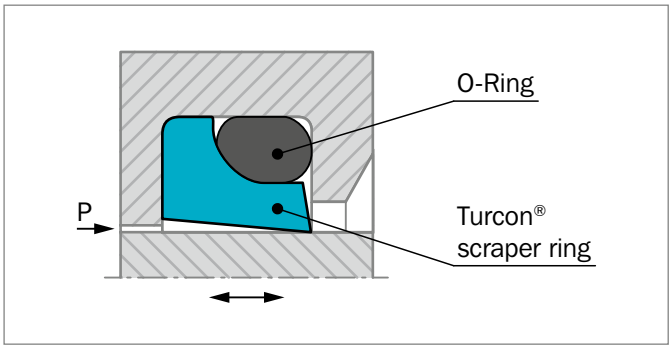


Figure 181: Turcon® Excluder® 1 an all-round single acting scraper

ADVANTAGES

- Simple compact groove requirement, same as Turcon® Excluder® 2
- Excellent scraping performance
- Excellent wear resistant
- Compact robust design
- Compensates for deflection of the piston rod
- Low friction
- No stick-slip effect
- No vulcanising to counter surface
- High and low temperature capability
- Very high resistance to hydraulic media
- Available in all sizes from 6 mm to 999 mm. Sizes above 1,000 mm are available on TSS Special Part Number
- ISO 6195 Type D housing dimension up to diameter 63 mm

OPERATING CONDITIONS

Speed linear:	Max. 15 m/s Turcon® materials Max. 5 m/s Zurcon® Z80 materials Max. 2 m/s Zurcon® Z53/Z54 materials
Temperature:	-45 °C to + 200 °C (Turcon®) -45 °C to + 80 °C (Zurcon® Z80) -45 °C to + 110 °C (Zurcon® Z53/Z54) depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on scraper ring and O-Ring material compatibility.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, environment, temperature and media.

INSTALLATION INSTRUCTIONS

Excluder® 1 scraper can be installed in split and closed grooves. Installation in closed grooves is dependent on the rod diameter, profile cross-section of the scraper and on the cord cross-section of the corresponding O-Ring, see Table 164.

Table 164: Installation in Closed Grooves

Turcon® Excluder® 1 Series No.	Rod Diameter d_N mm	O-Ring Cross Section d_2 mm
WEM3, WEL5	> 30	1.78
WEM3, WEL5, WEH1	> 30	2.62
WEM3, WEL5, WEH1	> 30	3.53
WEM3, WEL5, WEH1	> 40	5.33
WEM3, WEL5, WEH1	> 110	7.00
WEM3, WEH1	> 140	8.40

1) The O-Ring is installed in the groove.
2) The Excluder® ring is compressed into a kidney-shape and placed in the groove, see Figure 182.

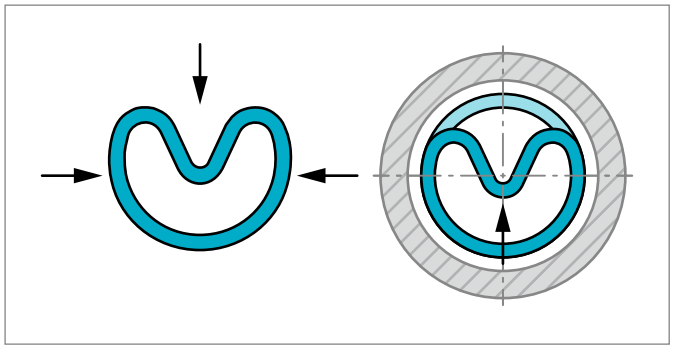


Figure 182: Place the Excluder® in compressed form into the groove behind the O-Ring and push Excluder® ring in the direction of the arrow

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Excluder® 1 in Turcon® M12
All round material for light to medium hydraulic applications linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Excluder® 1 in Turcon® T46
For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available. Other material combinations are listed in Table 165.

Table 165: Turcon® and Zurcon® Materials for Excluder® 1 and 113

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Turcon® M12 First material choice for linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Steel plated (rod) Cast iron Stainless steel Titanium	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray.	T40	NBR 70	N	-30 to +100	Steel Steel, chrome plated (rod) Cast iron Stainless steel Aluminum	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel, hardened Steel, chrome plated (rod) Cast iron	15
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finishes More difficult to install Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel Steel, hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	1
		NBR 70 Low temp.	T	-45 to +80		

Table continues on next page

Material, Applications, Properties	Code	O–Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	Speed max. m/s
Zurcon® Z54*** For mineral oil based fluids Linear and slowly turning movements High abrasion resistance For counter surface with rougher surface finishes Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel Steel, hardened Steel, chrome plated (rod) Cast iron Stainless steel Aluminum Ceramic coating	1
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene)	Z80	NBR 70	N	-30 to (+100)	Steel Steel, chrome plated (rod) Stainless steel Aluminum Ceramic coating	5
		NBR 70 Low temp.	T	-45 to +80		
		EPDM 70	E**	-45 to (+145)		

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil, except EPDM.

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by “Bundesanstalt Materialprüfung, Germany”.

Highlighted materials are recommended.

Installation Recommendation

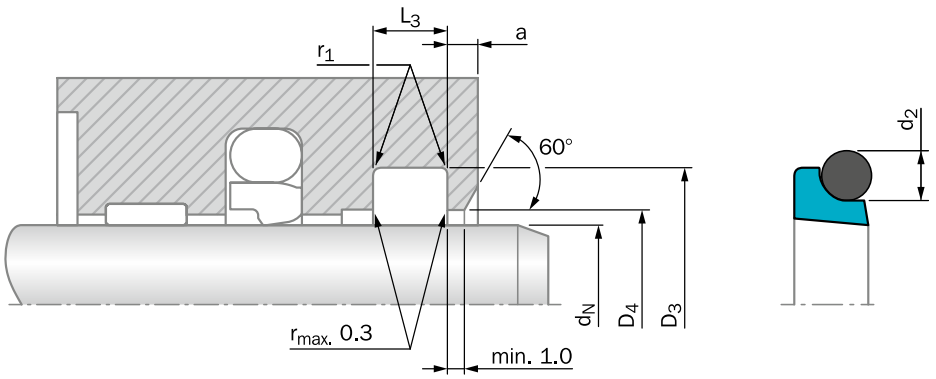


Figure 183: Installation Drawing

Table 166: Installation Dimensions – Standard Recommendations

Rod Diameter d_N f8/h9			Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
Serie No. WEM3 Standard Application	Serie No. WEL5 Light Application	Serie No. WEH1 Heavy Duty Application	D_3 H9	L_3 +0.2	D_4 H11	a_{min}	$r_{1\ max}$	d_2
6 - 11.9	12 - 64.9	-	d_N + 4.8	3.7	d_N + 1.5	2.0	0.4	1.78
12 - 64.9	65 - 250.9	6 - 11.9	d_N + 6.8	5.0	d_N + 1.5	2.0	0.7	2.62
65 - 250.9	251 - 420.9	12 - 64.9	d_N + 8.8	6.0	d_N + 1.5	3.0	1.0	3.53
251 - 420.9	421 - 650.9	65 - 250.9	d_N + 12.2	8.4	d_N + 2.0	4.0	1.2	5.33
421 - 650.9	651 - 999.9	251 - 420.9	d_N + 16.0	11.0	d_N + 2.0	4.0	1.5	7.00
651 - 999.9		421 - 650.9	d_N + 20.0	14.0	d_N + 2.5	5.0	2.0	8.40

Sizes from d_N 1,000.0 mm to d_N 2,600.0 mm are available on TSS special part number

ORDERING EXAMPLE

Turcon® Excluder® 1 complete with O-Ring, standard application:

Series:	WEM3 from Table 166
Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WEM300500 from Table 167

Select the material from Table 165. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number.The TSS Article No. for all intermediate sizes can be determined by following the example:

TSS Article No. WEM3 0 0500 - M12 N

- Series No.
- Type (Standard)
- Rod Diameter x 10
- Quality Index (Standard)
- Material Code (Scraper)
- Material Code (O-Ring)

Table 167: Installation Dimensions / TSS Part Numbers

Rod Dia. d_N f8/h9	Groove Dia. D_3 H9	Groove Width L_3 +0.2	TSS Part No.	O-Ring Size
6.0*	10.8	3.7	WEM300060	7.65 x 1.78
8.0*	12.8	3.7	WEM300080	9.50 x 1.80
10.0*	14.8	3.7	WEM300100	11.80 x 1.80
12.0*	18.8	5.0	WEM300120	13.94 x 2.62
14.0*	20.8	5.0	WEM300140	15.54 x 2.62
16.0*	22.8	5.0	WEM300160	18.00 x 2.65
18.0*	24.8	5.0	WEM300180	20.29 x 2.62
19.0	25.8	5.0	WEM300190	20.29 x 2.62
20.0*	26.8	5.0	WEM300200	21.89 x 2.62
22.0*	28.8	5.0	WEM300220	23.47 x 2.62
25.0*	31.8	5.0	WEM300250	26.64 x 2.62
28.0*	34.8	5.0	WEM300280	29.82 x 2.62
30.0	36.8	5.0	WEM300300	31.42 x 2.62
32.0*	38.8	5.0	WEM300320	34.59 x 2.62
33.0	39.8	5.0	WEM300330	34.59 x 2.62
34.0	40.8	5.0	WEM300340	36.17 x 2.62
35.0	41.8	5.0	WEM300350	36.17 x 2.62
36.0*	42.8	5.0	WEM300360	37.77 x 2.62
40.0*	46.8	5.0	WEM300400	42.52 x 2.62
45.0*	51.8	5.0	WEM300450	47.29 x 2.62
48.0	54.8	5.0	WEM300480	50.47 x 2.62
50.0*	56.8	5.0	WEM300500	52.07 x 2.62
56.0*	62.8	5.0	WEM300560	58.42 x 2.62
60.0	66.8	5.0	WEM300600	61.60 x 2.62
63.0*	69.8	5.0	WEM300630	64.77 x 2.62
65.0	73.8	6.0	WEM300650	66.27 x 3.53
70.0	78.8	6.0	WEM300700	72.62 x 3.53
75.0	83.8	6.0	WEM300750	75.79 x 3.53
80.0	88.8	6.0	WEM300800	82.14 x 3.53
85.0	93.8	6.0	WEM300850	85.32 x 3.53
90.0	98.8	6.0	WEM300900	91.67 x 3.53
100.0	108.8	6.0	WEM301000	101.19 x 3.53
110.0	118.8	6.0	WEM301100	110.72 x 3.53
120.0	128.8	6.0	WEM301200	120.24 x 3.53
130.0	138.8	6.0	WEM301300	132.94 x 3.53
140.0	148.8	6.0	WEM301400	142.47 x 3.53
150.0	158.8	6.0	WEM301500	151.99 x 3.53
160.0	168.8	6.0	WEM301600	158.34 x 3.53
180.0	188.8	6.0	WEM301800	177.39 x 3.53
200.0	208.8	6.0	WEM302000	202.79 x 3.53
225.0	233.8	6.0	WEM302250	228.19 x 3.53
250.0	258.8	6.0	WEM302500	253.59 x 3.53
275.0	287.2	8.4	WEM302750	278.77 x 5.33
300.0	312.2	8.4	WEM303000	304.17 x 5.33
320.0	332.2	8.4	WEM303200	304.17 x 5.33
380.0	392.2	8.4	WEM303800	380.37 x 5.33
400.0	412.2	8.4	WEM304000	405.26 x 5.33
450.0	466.0	11.0	WEM304500	443.36 x 7.00
480.0	496.0	11.0	WEM304800	481.38 x 7.00
500.0	516.0	11.0	WEM305000	494.16 x 7.00
550.0	566.0	11.0	WEM305500	557.66 x 7.00
600.0	616.0	11.0	WEM306000	608.08 x 7.00
640.0	656.0	11.0	WEM306400	633.48 x 7.00
680.0	700.0	14.0	WEM306800	685 x 8.40
700.0	720.0	14.0	WEM307000	705 x 8.40
750.0	770.0	14.0	WEM307500	755 x 8.40
800.0	820.0	14.0	WEM308000	805 x 8.40
850.0	870.0	14.0	WEM308500	855 x 8.40
900.0	920.0	14.0	WEM309000	905 x 8.40
950.0	970.0	14.0	WEM309500	955 x 8.40

* Installation in grooves according to ISO 6195 Type D

■ Turcon® Excluder® 113

■ Description

If Turcon® Excluder® 1 has been deformed or tilted by pressure activation, and acted as a seal, the pressure might have extruded and damaged the scraper lip.

To prevent this a one-way pressure relief version can be utilised where the pressure in all circumstances is channelled to a circumferential groove in Turcon® Excluder® 113 below the elastomers activation element. Should a high pressure appear, the scraping lip will shortly be lifted and the pressure released. Excluder® 113 is also applicable where the choice of seals would involve a risk of hydrodynamic pressure build-up between a seal and a double lip Excluder® .

Only available on TSS Standard Part No. in WEM3 series in all sizes from 6 mm to 999 mm. Sizes above 1,000 mm are available on TSS Special Part Number.

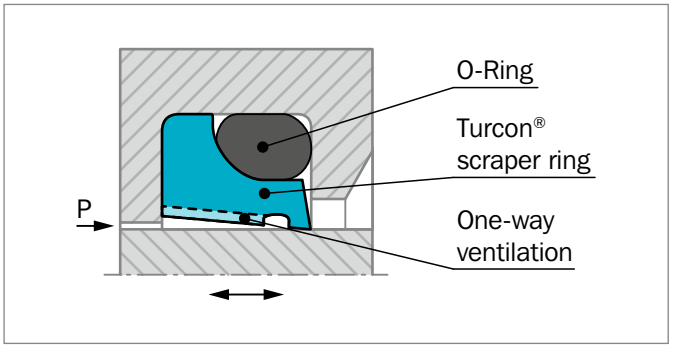


Figure 184: Turcon® Excluder® 113 with built-in one-way pressure relief

OPERATING CONDITIONS

Identical to Turcon® Excluder® 1 see page 489.

INSTALLATION INSTRUCTIONS

Excluder® 113 scrapers can be installed in split and closed grooves.

Installation in closed grooves is dependent on the rod diameter, profile cross-section of the scraper and on the cord cross-section of the corresponding O-Ring, see Table 168.

Table 168: Installation in Closed Grooves

Turcon® Excluder® 113 Series No.	Rod Diameter d_N mm	O-Ring Cross Section-Ø d_2 mm
WEM3E	> 30	1.78
WEM3E	> 30	2.62
WEM3E	> 30	3.53
WEM3E	> 40	5.33
WEM3E	> 110	7.00
WEM3E	> 140	8.40

Installation procedure is identical to Turcon® Excluder® 1

MATERIALS

Identical to Turcon® Excluder® 1, see Table 165.

Installation Recommendation

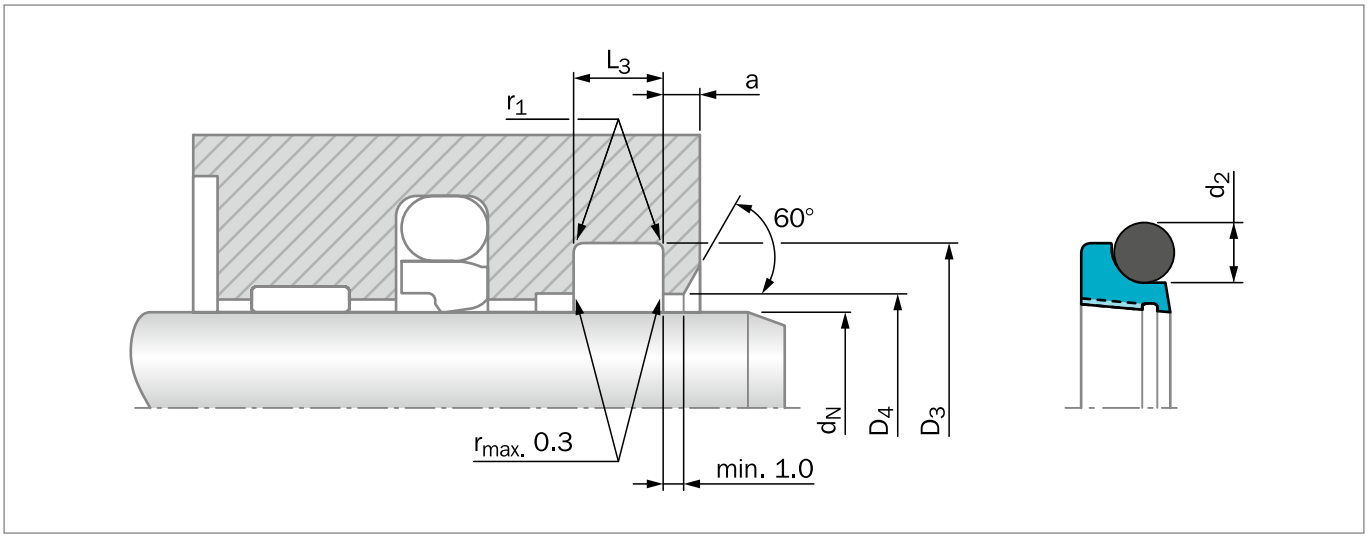


Figure 185: Installation Drawing

Table 169: Installation Dimensions

Series No.	Rod Diameter d_N f8/h9	Groove Diameter	Groove Width	Bore Diameter	Step Width	Radius	O-Ring Cross Section
	Standard Application	D_3 H9	L_3 +0.2/-0.0	D_4 H11	a_{min}	$r_{1\ max}$	d_2
WEM3E	6 – 11.9	d_N + 4.8	3.7	d_N + 1.5	2.0	0.4	1.78
WEM3E	12 – 64.9	d_N + 6.8	5.0	d_N + 1.5	2.0	0.7	2.62
WEM3E	65 – 250.9	d_N + 8.8	6.0	d_N + 1.5	3.0	1.0	3.53
WEM3E	251 – 420.9	d_N + 12.2	8.4	d_N + 2.0	4.0	1.2	5.33
WEM3E	421 – 650.9	d_N + 16.0	11.0	d_N + 2.0	4.0	1.5	7.00
WEM3E	651 – 999.9	d_N + 20.0	14.0	d_N + 2.5	5.0	2.0	8.40

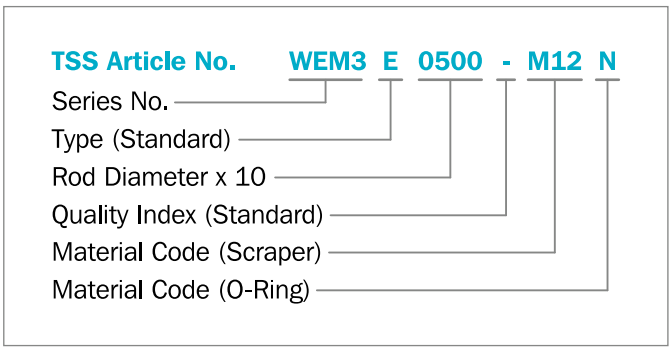
Sizes from d_N 1,000.0 mm to d_N 2,600.0 mm are available on special part number.

ORDERING EXAMPLE

Turcon® Excluder® 113 complete with O-Ring, standard application:

Series:	WEM3E from Table 169
Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WEM3E0500 from Table 167

Select the material from Table 165. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article No. for all intermediate sizes can be determined by following the example:



Scraper DA17

Double-acting

Material:
Rubber

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Scraper DA17

Description

The scraper DA17 is a molded double-acting elastomer scraper. It has two geometrically different scraper lips.

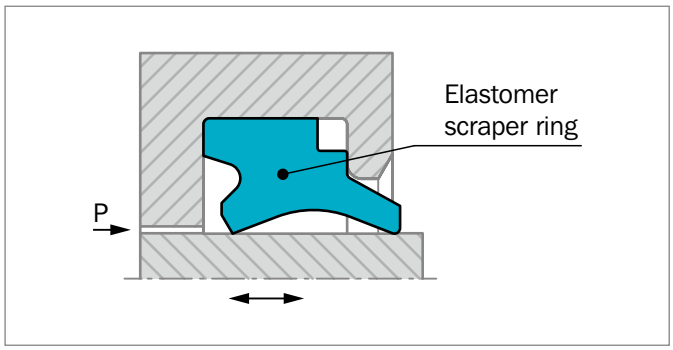

Figure 186: Scraper DA17

The scraper is preferably used for reciprocating piston rods and plunger pistons in hydraulic cylinders. It prevents the penetration of dirt into the system and on the medium side holds back the residual oil film from the extending piston rod.

The scraper is preferably used in conjunction with our rod seal Turcon® Stepseal® , i.e. seals with a hydrodynamic back-pumping function.

ADVANTAGES

- Low friction
- Good scraping effect both inwards and outwards
- Simple, small installation groove
- Compact design
- Easy installation and removal without tools

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-25 °C to +100 °C
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids (HFA, HFB, HFC), water, air, etc.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIAL

Standard material: NBR 90 Shore A

■ Installation Recommendation

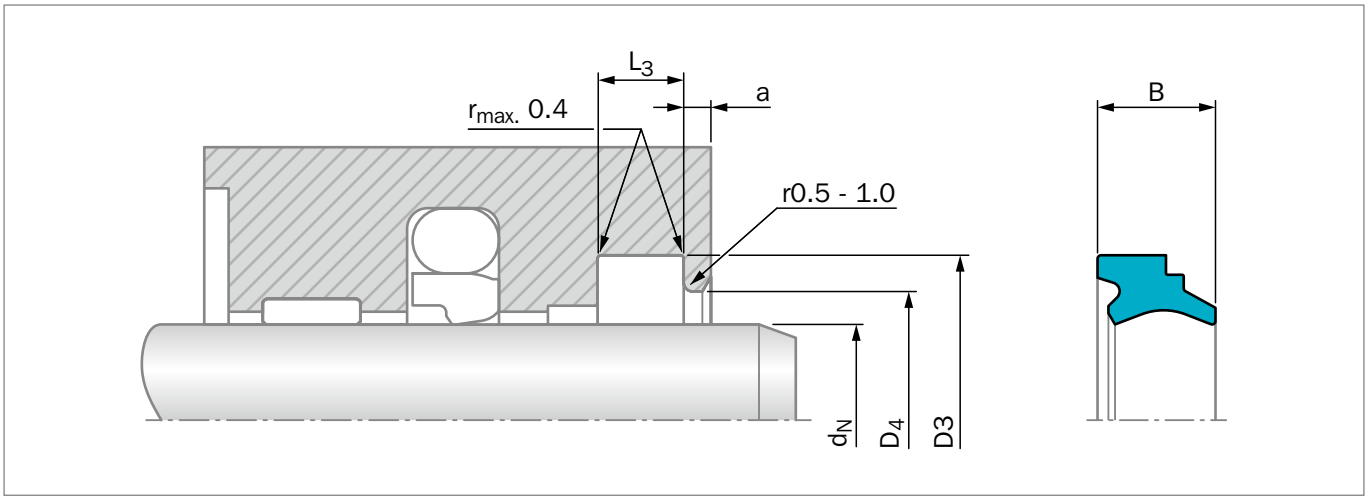

Figure 187: Installation Drawing

ORDERING EXAMPLE

Scraper DA17

Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WD1700500 from Table 170
Material:	Standard material NBR 90 Shore A, Code N9

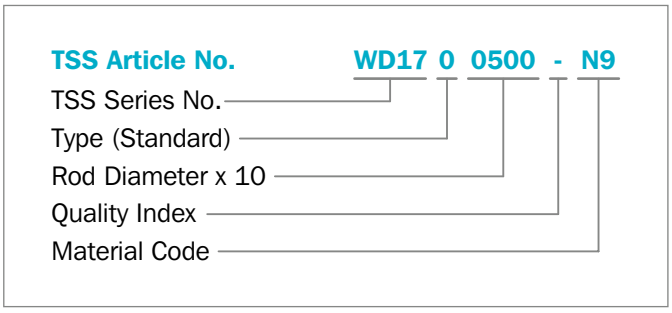

Table 170: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	Step Width	Width	TSS Part No.
d_N f8/h9	D3 H9	L_3 +0.2	D_4 H11	a_{min}	B	
10.0	**18.0**	**6.0**	**13.5**	**2.0**	**8.0**	**WD1700100**
12.0	**20.0**	**6.0**	**15.5**	**2.0**	**8.0**	**WD1700120**
14.0	**22.0**	**6.0**	**17.5**	**2.0**	**8.0**	**WD1700140**
15.0	23.0	6.0	18.5	2.0	8.0	WD1700150
16.0	**24.0**	**6.0**	**19.5**	**2.0**	**8.0**	**WD1700160**
18.0	**26.0**	**6.0**	**21.5**	**2.0**	**8.0**	**WD1700180**
20.0	**28.0**	**6.0**	**23.5**	**2.0**	**8.0**	**WD1700200**
22.0	**30.0**	**6.0**	**25.5**	**2.0**	**8.0**	**WD1700220**
24.0	32.0	6.0	27.5	2.0	8.0	WD1700240
25.0	**33.0**	**6.0**	**28.5**	**2.0**	**8.0**	**WD1700250**
28.0	**36.0**	**6.0**	**31.5**	**2.0**	**8.0**	**WD1700280**
30.0	38.0	6.0	33.5	2.0	8.0	WD1700300

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	Step Width	Width	TSS Part No.
d_N f8/h9	D3 H9	L_3 +0.2	D_4 H11	a_{min}	B	
32.0	**40.0**	**6.0**	**35.5**	**2.0**	**8.0**	**WD1700320**
35.0	43.0	6.0	38.5	2.0	8.0	WD1700350
36.0	44.0	6.0	39.5	2.0	8.0	WD1700360
37.0	45.0	6.0	40.5	2.0	8.0	WD1700370
38.0	46.0	6.0	41.5	2.0	8.0	WD1700380
40.0	**48.0**	**6.0**	**43.5**	**2.0**	**8.0**	**WD1700400**
42.0	50.0	6.0	45.5	2.0	8.0	WD1700420
45.0	**53.0**	**6.0**	**48.5**	**2.0**	**8.0**	**WD1700450**
46.0	54.0	6.0	49.5	2.0	8.0	WD1700460
48.0	56.0	6.0	51.5	2.0	8.0	WD1700480
50.0	**58.0**	**6.0**	**53.5**	**2.0**	**8.0**	**WD1700500**
52.0	60.0	6.0	55.5	2.0	8.0	WD1700520
55.0	63.0	6.0	58.5	2.0	8.0	WD1700550
56.0	**64.0**	**6.0**	**59.5**	**2.0**	**8.0**	**WD1700560**
60.0	68.0	6.0	63.5	2.0	8.0	WD1700600
63.0	**71.0**	**6.0**	**66.5**	**2.0**	**8.0**	**WD1700630**
65.0	73.0	6.0	68.5	2.0	8.0	WD1700650
68.0	76.0	6.0	71.5	2.0	8.0	WD1700680
70.0	**78.0**	**6.0**	**73.5**	**2.0**	**8.0**	**WD1700700**
75.0	83.0	6.0	78.5	2.0	8.0	WD1700750
80.0	**88.0**	**6.0**	**83.5**	**2.0**	**8.0**	**WD1700800**
85.0	93.0	6.0	88.5	2.0	8.0	WD1700850
90.0	**98.0**	**6.0**	**93.5**	**2.0**	**8.0**	**WD1700900**
95.0	103.0	6.0	98.5	2.0	8.0	WD1700950
100.0	**108.0**	**6.0**	**103.5**	**2.0**	**8.0**	**WD1701000**
105.0	117.0	8.2	110.0	3.0	11.0	WD1701050
110.0	**122.0**	**8.2**	**115.0**	**3.0**	**11.0**	**WD1701100**
115.0	127.0	8.2	120.0	3.0	11.0	WD1701150
120.0	132.0	8.2	125.0	3.0	11.0	WD1701200
125.0	**137.0**	**8.2**	**130.0**	**3.0**	**11.0**	**WD1701250**
130.0	142.0	8.2	135.0	3.0	11.0	WD1701300
135.0	147.0	8.2	140.0	3.0	11.0	WD1701350
140.0	**152.0**	**8.2**	**145.0**	**3.0**	**11.0**	**WD1701400**
145.0	157.0	8.2	150.0	3.0	11.0	WD1701450
150.0	162.0	8.2	155.0	3.0	11.0	WD1701500
155.0	167.0	8.2	160.0	3.0	11.0	WD1701550
160.0	**172.0**	**8.2**	**165.0**	**3.0**	**11.0**	**WD1701600**
165.0	177.0	8.2	170.0	3.0	11.0	WD1701650
170.0	182.0	8.2	175.0	3.0	11.0	WD1701700
180.0	**192.0**	**8.2**	**185.0**	**3.0**	**11.0**	**WD1701800**
185.0	197.0	8.2	190.0	3.0	11.0	WD1701850
190.0	202.0	8.2	195.0	3.0	11.0	WD1701900

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	Step Width	Width	TSS Part No.
d_N f8/h9	D3 H9	L_3 +0.2	D_4 H11	a_{min}	B	
195.0	207.0	8.2	200.0	3.0	11.0	WD1701950
200.0	**212.0**	8.2	**205.0**	**3.0**	**11.0**	**WD1702000**
205.0	220.0	9.5	212.0	3.0	13.0	WD1702050
210.0	225.0	9.5	217.0	3.0	13.0	WD1702100
220.0	**235.0**	**9.5**	**227.0**	**3.0**	**13.0**	**WD1702200**
225.0	240.0	9.5	232.0	3.0	13.0	WD1702250
240.0	255.0	9.5	247.0	3.0	13.0	WD1702400
250.0	**265.0**	**9.5**	**257.0**	**3.0**	**13.0**	**WD1702500**
260.0	275.0	9.5	267.0	3.0	13.0	WD1702600
275.0	290.0	9.5	282.0	3.0	13.0	WD1702750
280.0	**295.0**	**9.5**	**287.0**	3.0	**13.0**	**WD1702800**
290.0	305.0	9.5	297.0	3.0	13.0	WD1702900
300.0	315.0	9.5	307.0	3.0	13.0	WD1703000
310.0	325.0	9.5	317.0	3.0	13.0	WD1703100
320.0	**335.0**	**9.5**	**327.0**	**3.0**	**13.0**	**WD1703200**
350.0	365.0	9.5	357.0	3.0	13.0	WD1703500
360.0	**375.0**	**9.5**	**367.0**	**3.0**	**13.0**	**WD1703600**
370.0	385.0	9.5	377.0	3.0	13.0	WD1703700
400.0	415.0	9.5	407.0	3.0	13.0	WD1704000
440.0	455.0	9.5	447.0	3.0	13.0	WD1704400

The rod diameters in **bold** type comply with the recommendations of ISO 3320.
Intermediate sizes above 125 mm diameter can also be supplied in impact vulcanized form.
Up to 18 mm diameter, we recommend a split groove.
Other dimensions on request.

Zurcon® Scraper DA22

Double-acting

Material:
Zurcon®

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■ Zurcon® Scraper DA22

■ Description

The scraper is a double-acting polyurethane wiper for closed groove installation. Significant improvements are achieved regarding the profile geometry and material used if compared with conventional elastomeric scrapers.

The scraper lip is designed in a particular way that it reliably scrapes off the dirt but leaves a residual oil film on the rod, which is required for correct operation. The radial squeeze is sufficient to remove particles, dust and water.

The scraping lip facing inwards is designed in a way that it assumes a sealing function even under low pressure. The static seal is achieved by a tight radial fit between the scraper body and the groove.

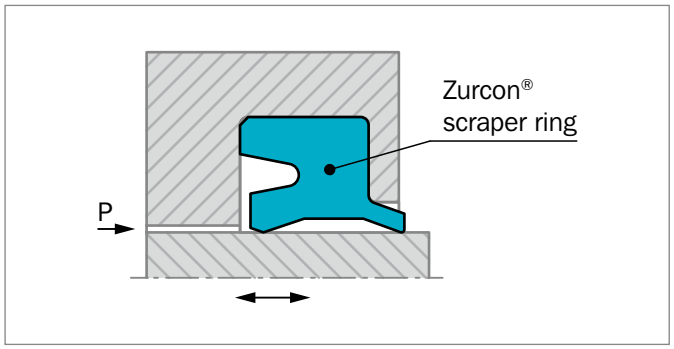

Figure 188: Scraper DA22

ADVANTAGES

- Good scraping effect
- Wear resistant, long service life
- Retaining residual oil film
- Standard elements for standardized installation grooves.

APPLICATION EXAMPLES

Due to the outstanding wiping capacities, DA22 scraper is recommended wherever there are dusty and humid conditions and especially for the following applications:

- ISO standard cylinders
- Hydraulic industrial cylinders
- Agriculture machinery

OPERATING CONDITIONS

Pressure Scraper Side:	Atmospheric pressure
Seal Side:	Pressures up to 2 MPa (20 bar) a relief bore must be provided with higher pressures
Speed:	Up to 1 m/s
Temperature:	-35 °C to +100 °C
Media:	Mineral oils and greases
Groove Type:	Split/Closed (depending on size)

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Standard application:

Zurcon® Polyurethane:	92 Shore A
Material Code:	Z201
Color:	Turquoise

■ Installation Recommendation

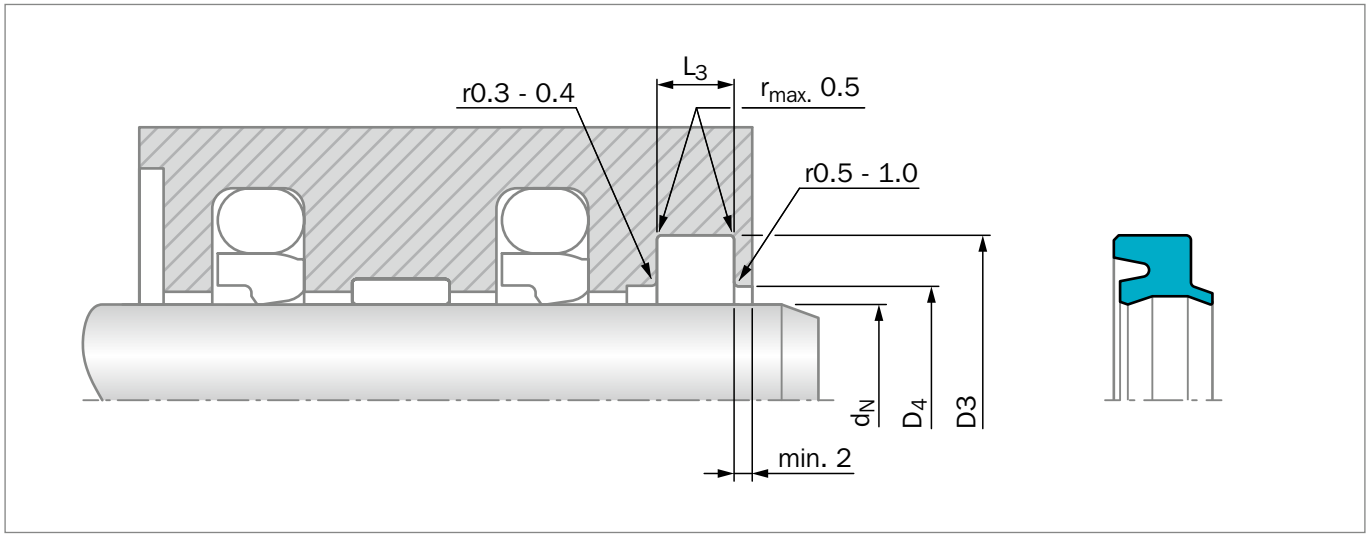

Figure 189: Installation Drawing

ORDERING EXAMPLE

Rod Diameter:	d_N = 36 mm
Groove Diameter:	D3 = 44 mm
TSS Part No.:	WD2200360 from Table 171
Material Code:	Z201

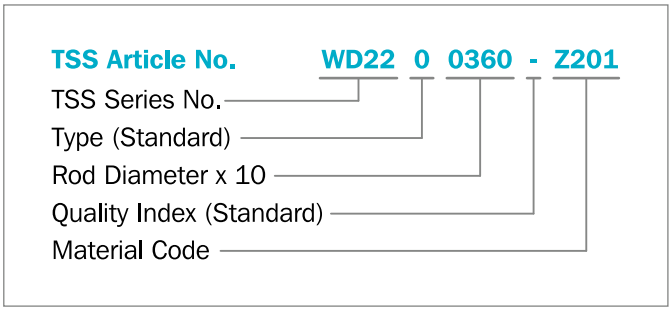

Table 171: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.
d_N f8/h9	**D3** H9	**L_3** +0.2	**D_4** H11	
5.0	10.0	3.5	7.5	WD2200050
8.0	13.0	3.5	10.5	WD2200080
10.0	16.0	4.0	12.5	WD2200100
12.0	**18.0**	**4.0**	**14.5**	**WD2200120**
12.0	18.6	3.8	15.0	WD2210120
14.0	**20.0**	**4.0**	**16.5**	**WD2200140**
14.0	20.6	3.8	17.0	WD2210140
16.0	22.0	4.0	18.5	WD2200160
18.0	**24.0**	**4.0**	**20.5**	**WD2200180**
18.0	24.6	3.8	21.0	WD2210180

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.
d_N f8/h9	D3 H9	L_3 +0.2	D_4 H11	
20.0	26.0	4.0	22.5	WD2200200
20.0	28.6	5.3	23.0	WD2210200
22.0	**28.0**	**4.0**	**24.5**	**WD2200220**
22.0	30.6	5.3	25.0	WD2210220
24.0	32.6	5.3	27.0	WD2210240
25.0	31.0	4.0	27.5	WD2200250
25.0	33.6	5.3	28.0	WD2210250
28.0	**36.0**	**5.0**	**31.0**	**WD2200280**
28.0	36.6	5.3	31.0	WD2210280
30.0	38.0	5.0	33.0	WD2200300
30.0	38.6	5.3	33.0	WD2210300
32.0	40.0	5.0	35.0	WD2200320
35.0	43.0	5.0	38.0	WD2200350
35.0	43.6	5.3	38.0	WD2210350
36.0	**44.0**	**5.0**	**39.0**	**WD2200360**
36.0	44.6	5.3	39.0	WD2210360
40.0	48.0	5.0	43.0	WD2200400
40.0	48.6	5.3	43.0	WD2210400
45.0	**53.0**	**5.0**	**48.0**	**WD2200450**
45.0	53.6	5.3	48.0	WD2210450
50.0	58.0	5.0	53.0	WD2200500
50.0	58.6	5.3	53.0	WD2210500
55.0	63.6	5.3	58.0	WD2210550
55.0	65.0	6.0	58.0	WD2200550
56.0	64.6	5.3	59.0	WD2210560
56.0	**66.0**	**6.0**	**59.0**	**WD2200560**
60.0	68.6	5.3	63.0	WD2210600
60.0	70.0	6.0	63.0	WD2200600
63.0	71.6	5.3	66.0	WD2210630
63.0	73.0	6.0	66.0	WD2200630
65.0	75.0	6.0	68.0	WD2200650
70.0	78.6	5.3	73.0	WD2210700
70.0	**80.0**	**6.0**	**73.0**	**WD2200700**
75.0	83.6	5.3	78.0	WD2210750
75.0	85.0	6.0	78.0	WD2200750
80.0	88.6	5.3	83.0	WD2210800
80.0	90.0	6.0	83.0	WD2200800
85.0	95.0	6.0	88.0	WD2200850
85.0	97.2	7.1	91.0	WD2210850
90.0	**100.0**	**6.0**	**93.0**	**WD2200900**
90.0	102.2	7.1	96.0	WD2210900
100.0	110.0	6.0	103.0	WD2201000

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.
d_N f8/h9	D3 H9	L_3 +0.2	D_4 H11	
100.0	112.2	7.1	106.0	WD2211000
110.0	122.2	7.1	116.6	WD2211100
110.0	**125.0**	**8.5**	**114.0**	**WD2201100**
120.0	135.0	8.5	124.0	WD2201200
125.0	140.0	8.5	129.0	WD2201250
140.0	**155.0**	**8.5**	**144.0**	**WD2201400**
150.0	165.0	8.5	154.0	WD2201500
160.0	175.0	8.5	164.0	WD2201600
180.0	195.0	8.5	184.0	WD2201800

The sizes in **bold** type comply with ISO 6195. Installation groove Type C.
Up to 18 mm diameter we recommend a split groove.
Other sizes on request.

Zurcon® Scraper DA24 & Venting Version

Double-acting

Material:
Zurcon®

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■ Zurcon® Scraper DA24

■ Description

Zurcon® DA24 is a double-acting thermoplastic polyurethane scraper for severe operating conditions and heavy attack of dirt.

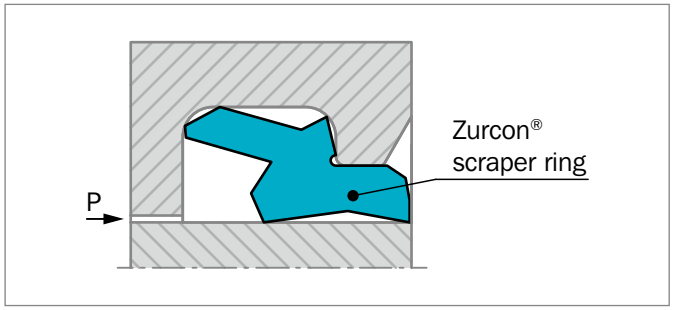


Figure 190: Scraper DA24: Standard Version

A new improved design available now in two different versions has been recently developed by Trelleborg Sealing Solutions to enhance the overall performances.

The special design of the inward-facing sealing lip contributes to an optimum contact pressure resulting in a very high scraper effect of the residual oil film thanks to the sharp, knife cut, scraping lip.

The outer scraper lip leans against the housing. This ensures an optimum sealing force and further it prevents the ingress of dirt and water across the groove bottom. Also in case of high level of external contamination and dirt or rod eccentricity under side load the scraper effect remains stable. The improved design reduces the friction with less heat generated and a longer service life.

The new design of DA24 is now available in two versions: standard and venting.

DA24 is produced in Zurcon® , the Trelleborg Sealing Solutions proprietary thermoplastic polyurethane material specially developed for sealing applications. This provides long service life under harsh working conditions and resistance against installation damage

ADVANTAGES

- Very good scraper effect of the outward lip
- Very good sealing effect due to a trimmed inner sealing lip: Provides optimum contact pressure for efficient sealing and wiping of residual oil film
- Reliable at side steering of the piston rod
- Sturdy and wear-resistant
- Simple installation
- Advanced friction characteristics
- Limited heat generation extending service life
- Stability in the groove securing function
- Robust outer scraper lip supported by a housing recess, it ensures a high contact force on the rod

VENTING VERSION FEATURE

In some situations when there is pressure build-up behind the scraper, the scraper can be pushed out of the groove causing total sealing system failure.

Zurcon® Scraper DA24 Venting Version has axial holes through the section which operate as pressure relief valves, allowing oil to be released in the case of overpressure.

Once the pressure is build-up the outer lip is temporarily activated through the axial holes and the pressure is released avoiding system failure. With improved stability in the groove the Zurcon® Scraper DA24 Venting Version becomes one of the most efficient scrapers available on the market.

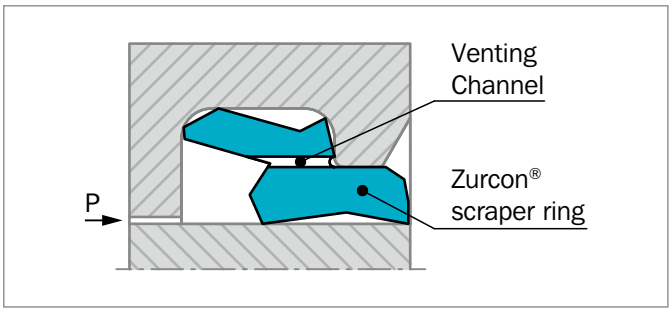
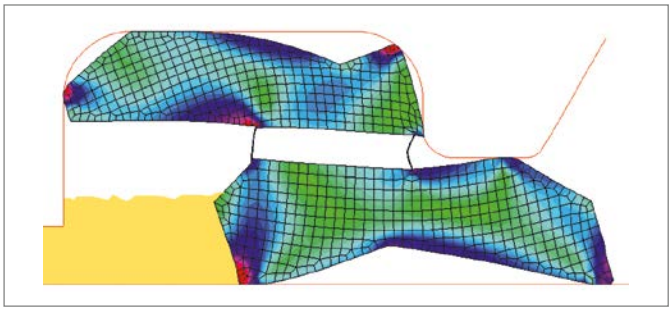
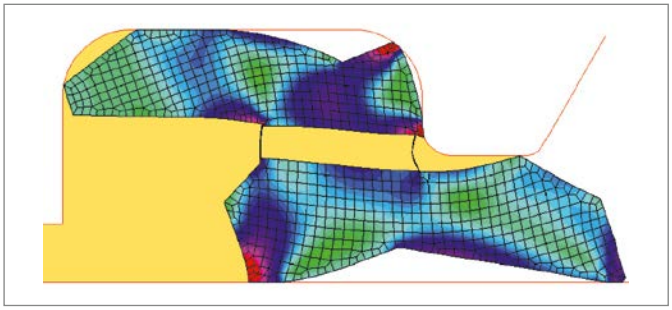


Figure 191: Scraper DA24: Venting Version

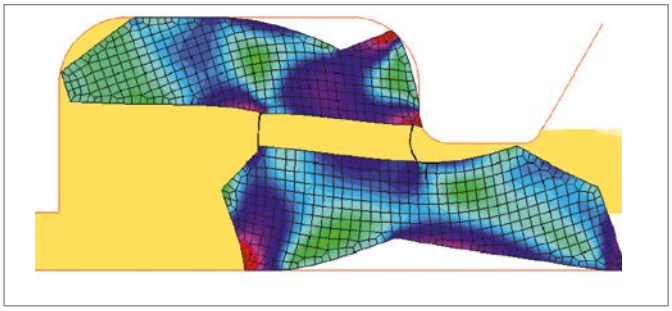
METHOD OF OPERATION FOR VENTING VERSION



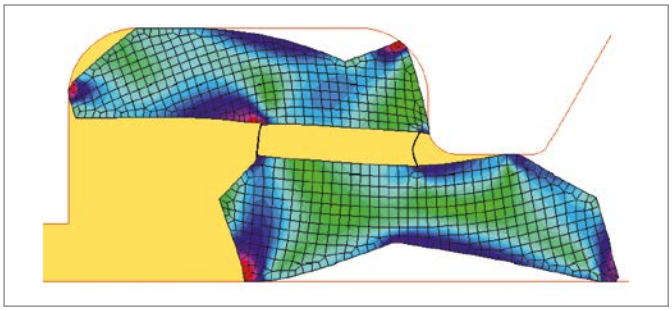
1. Pressurized oil flows through holes in the profile at the top of the scraping lip.



2. The scraping lip is pressed to the rod during pressure build-up.



3. A gap opens up between scraping lip and housing at a certain pressure level.



4. The oil is released and pressure is relieved.

APPLICATION EXAMPLES

The scraper DA24 is especially suitable for application in:

- Construction machinery
- Agriculture- and forestry machinery
- Mobile hydraulic
- High attack of dirt
- Side steering of piston rod

OPERATING CONDITIONS

Pressure:	standard version: max. 5 MPa venting version: max. 2 MPa
Velocity:	Up to 1 m/s at high strokes and higher speed, please contact your local Trelleborg Sealing Solutions company
Temperature:	-35 °C to +100 °C
Media:	Hydraulic fluids based on mineral oil

MATERIALS – STANDARD APPLICATION:

The scraper DA24 consists of Zurcon® polyurethane material with excellent wear and extrusion resistance and low deformation under load.

Special Polyurethane: Zurcon® Z201 92 Shore A
Set reference: Z201
Color: Turquoise

PREMIUM MATERIALS – HYDROLYSIS RESISTANCE:

Zurcon® Z24 Premium polyurethane

Set reference: Z24

The Zurcon® polyurethane has high abrasion resistance, a low compression set, high extrusion resistance and a wide temperature range.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

Installation Recommendation

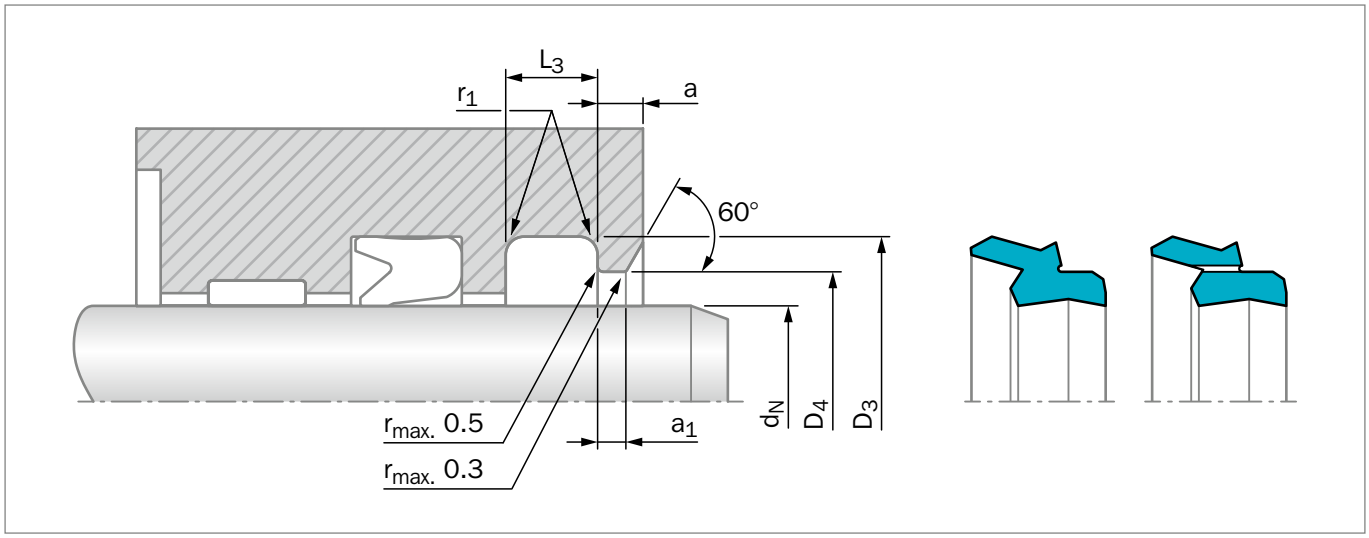


Figure 192: Installation Drawing

Table 172: Preferred Series / Order No.

Rod Diameter	Groove Diameter	Groove Width	Radius	Bore Diameter	Step Width	Step Width	TSS Part No. Standard Version
d_N f8/h9	D_3 H9	L_3 +0.2	r_1 max.	D_4 H9	a min.	a_1 min.	
45.0	53.8	6.3	1.2	49.4	3.2	2.0	WD2410450
50.0	58.8	6.3	1.2	54.4	3.2	2.0	WD2410500
56.0	64.8	6.3	1.2	60.4	3.2	2.0	WD2410560
60.0	68.8	6.3	1.2	64.4	3.2	2.0	WD2410600
70.0	82.2	8.1	1.6	76.0	4.0	2.5	WD2410700
75.0	87.2	8.1	1.6	81.0	4.0	2.5	WD2410750
80.0	92.2	8.1	1.6	86.0	4.0	2.5	WD2410800
85.0	97.2	8.1	1.6	91.0	4.0	2.5	WD2410850
90.0	102.2	8.1	1.6	96.0	4.0	2.5	WD2410900
95.0	107.2	8.1	1.6	101.0	4.0	2.5	WD2410950
100.0	112.2	8.1	1.6	106.0	4.0	2.5	WD2411000
105.0	117.2	8.1	1.6	111.0	4.0	2.5	WD2411050
110.0	122.2	8.1	1.6	116.0	4.0	2.5	WD2411100
115.0	127.2	8.1	1.6	121.0	4.0	2.5	WD2411150
125.0	137.2	8.1	1.6	131.0	4.0	2.5	WD2411250
140.0	156.0	9.5	2.0	148.0	5.0	3.0	WD2411400
150.0	166.0	9.5	2.0	158.0	5.0	3.0	WD2411500
160.0	176.0	9.5	2.0	168.0	5.0	3.0	WD2411600
170.0	186.0	9.5	2.0	178.0	5.0	3.0	WD2411700
180.0	196.0	9.5	2.0	188.0	5.0	3.0	WD2411800

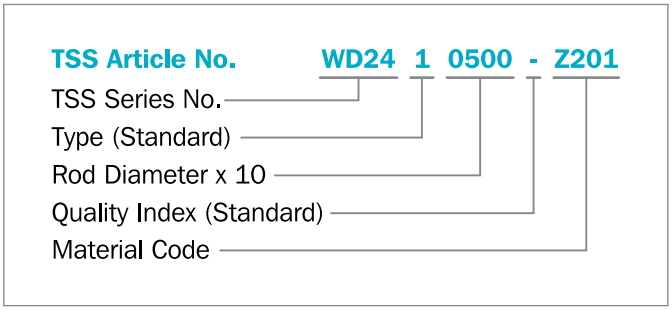
Rod Diameter	Groove Diameter	Groove Width	Radius	Bore Diameter	Step Width	Step Width	TSS Part No. Standard Version
d_N f8/h9	D_3 H9	L_3 +0.2	r_1 max.	D_4 H9	a min.	a_1 min.	
200.0	216.0	9.5	2.0	208.0	5.0	3.0	WD2412000
220.0	236.0	9.5	2.0	228.0	5.0	3.0	WD2412200
240.0	256.0	9.5	2.0	248.0	5.0	3.0	WD2412400
260.0	276.0	9.5	2.0	268.0	5.0	3.0	WD2412600
280.0	296.0	9.5	2.0	288.0	5.0	3.0	WD2412800
290.0	306.0	9.5	2.0	298.0	5.0	3.0	WD2412900

Other dimensions on request

ORDERING EXAMPLE

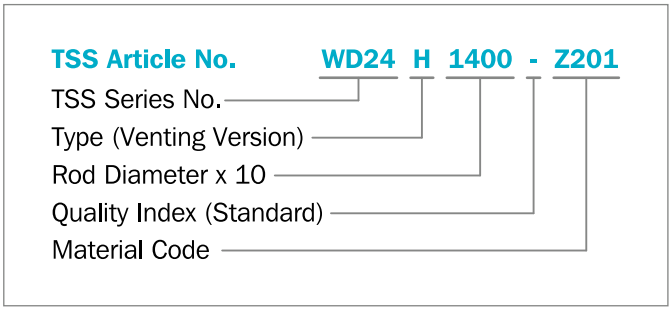
Standard Version:

Rod Diameter:	d_N = 50 mm
Groove Diameter:	D_3 = 58.8 mm
Groove Width:	L_3 = 6.3 mm
TSS Part No.:	WD2410500 from Table 172
Material:	Standard material Z201



Venting Version:

Rod Diameter:	d_N = 140 mm
Groove Diameter:	D_3 = 156 mm
Groove Width:	L_3 = 9.5 mm
TSS Part No.:	WD24H1400
Material:	Standard material Z201



Scraper WRM

Single-acting

Material:
NBR Elastomer

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Scraper WRM

Description

Scraper rings are essential components of any hydraulic or pneumatic equipment.

These are protection components for axial moving rods: they ensure that foreign matter is not introduced into the system, avoiding costly wear and damage to all the internal components including seals.

WRM scrapers are manufactured in nitrile elastomer with precision machined wiper lip, which produces a very effective wiping action.

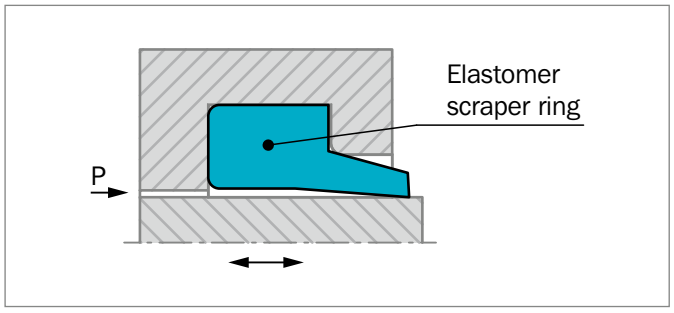

Figure 193: Scraper WRM

ADVANTAGES

- Space-saving construction
- Low cost, economical solution
- Simple, easy-construction groove
- Easy installation and removal without tools

APPLICATION EXAMPLES

Due to their outstanding wiping capacities WRM scrapers are recommended wherever there are dusty and humid conditions and especially for the following applications:

- Valve spindles
- Slide valves
- Hydraulic cylinders
- Agriculture machinery

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-30 °C to +110 °C
Media:	Mineral oil based hydraulic fluids, polyglycol-water emulsions, water-oil emulsions
Groove Type:	Closed

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Standard application

Nitrile elastomer:	NBR 90 Shore A
Material Code:	N9T60
Polypac Ref. code:	2790

■ Installation Recommendation

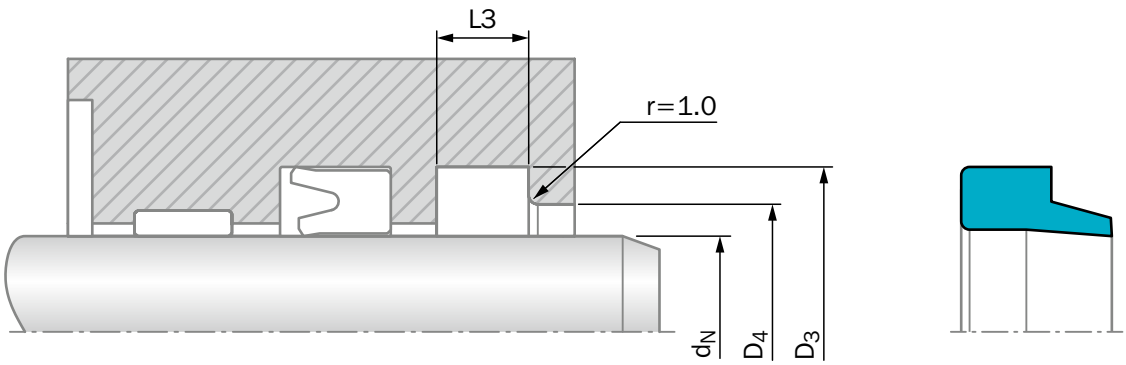

Figure 194: Installaton Drawing

ORDERING EXAMPLE

Rod Diameter:	d_N = 40 mm
TSS Part No.:	WAP000400 from Table 173
Material Code:	N9T60 (standard)
Polypac Ref.:	WRM 157188

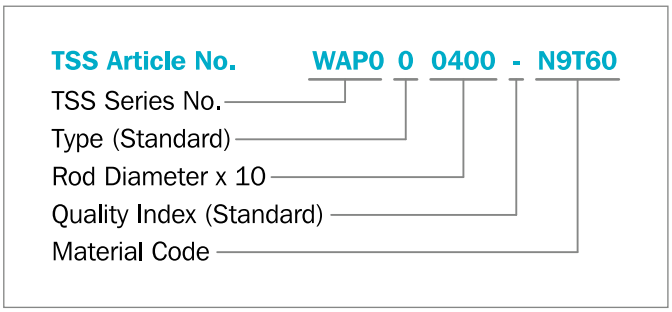

Table 173: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.	Description
d_N f8/h9	D_3 H9	L3 +0.2	D_4 +0.2		
12.0	18.6	3.8	15.0	WAP000120	WRM047070
13.0	19.6	3.8	16.0	WAP000130	WRM051074
14.0	20.6	3.8	17.0	WAP000140	WRM055078
15.0	21.6	3.8	18.0	WAP000150	WRM059082
16.0	22.6	3.8	19.0	WAP000160	WRM062087
17.0	23.6	3.8	20.0	WAP000170	WRM066094
18.0	24.6	3.8	21.0	WAP000180	WRM070094
19.0	28.6	5.3	22.0	WAP000190	WRM074110
20.0	28.6	5.3	23.0	WAP000200	WRM078110
22.0	30.6	5.3	25.0	WAP000220	WRM086118
24.0	32.6	5.3	27.0	WAP000240	WRM094125
25.0	31.6	5.3	28.0	WAP100250	WRM098122/S
25.0	33.6	5.3	28.0	WAP000250	WRM098129
26.0	34.6	5.3	29.0	WAP000260	WRM102133

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.	Description
d_N f8/h9	D_3 H9	L3 +0.2	D_4 +0.2		
27.0	35.6	5.3	30.0	WAP000270	WRM106137
28.0	36.6	5.3	31.0	WAP000280	WRM110141
30.0	38.6	5.3	33.0	WAP000300	WRM118149
31.0	41.0	6.0	34.0	WAP000310	WRM4544907
32.0	40.6	5.3	35.0	WAP000320	WRM125157
33.0	41.6	5.3	36.0	WAP000330	WRM129161
35.0	43.6	5.3	38.0	WAP000350	WRM137169
36.0	44.6	5.3	39.0	WAP000360	WRM141173
38.0	46.6	5.3	41.0	WAP000380	WRM149181
40.0	48.6	5.3	43.0	WAP000400	WRM157188
42.0	50.6	5.3	45.0	WAP000420	WRM165196
45.0	53.6	5.3	48.0	WAP000450	WRM177208
45.0	55.6	5.3	49.0	WAP100450	WRM177216
46.0	54.6	5.3	49.0	WAP000460	WRM181212
48.0	56.6	5.3	51.0	WAP000480	WRM188220
49.0	57.6	5.3	52.0	WAP000490	WRM193225
50.0	58.6	5.3	53.0	WAP000500	WRM196228
50.0*	60.6	5.3	54.0	WAP100500	WRM196236
50.8	60.9	5.8	55.5	WAP000508	WRM200237
53.0*	61.6	5.3	56.0	WAP000530	WRM208240
55.0*	63.6	5.3	58.0	WAP000550	WRM216248
55.0	65.6	5.3	59.0	WAP100550	WRM216255
60.0	68.6	5.3	63.0	WAP000600	WRM236267
63.0*	71.6	5.3	66.0	WAP000630	WRM248279
63.0	73.6	5.3	67.0	WAP100630	WRM248287
65.0	73.6	5.3	68.0	WAP000650	WRM255287
65.0	75.6	5.3	69.0	WAP100650	WRM255295
70.0*	76.0	4.3	72.0	WAP000700	WRM275299
70.0	78.6	5.3	73.0	WAP100700	WRM275307
70.0	80.6	5.3	72.0	WAP200700	WRM275314
70.0	82.6	7.1	76.0	WAP300700	WRM275322
72.0	80.6	5.3	75.0	WAP000720	WRM283317
73.0	81.6	5.3	76.0	WAP000730	WRM287318
75.0	83.6	5.3	78.0	WAP000750	WRM295326
75.0	87.2	7.1	81.0	WAP100750	WRM295345
76.5	88.7	7.1	82.5	WAP000765	WRM301348
78.0	92.2	7.1	85.0	WAP000780	WRM307362
80.0	88.6	5.3	83.0	WAP000800	WRM314346
80.0	92.6	7.1	86.0	WAP100800	WRM314362
83.0	91.6	5.3	86.0	WAP000830	WRM326358
84.0	92.0	5.3	87.0	WAP000840	WRM330362
85.0	93.6	5.3	88.0	WAP000850	WRM334366

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.	Description
d_N f8/h9	D_3 H9	L3 +0.2	D_4 +0.2		
85.0	97.2	7.1	91.0	WAP100850	WRM334381
88.0	100.2	7.1	94.0	WAP000880	WRM346393
90.0	102.2	7.1	96.0	WAP000900	WRM354401
95.0	107.2	7.1	101.0	WAP000950	WRM374421
97.0	111.0	7.1	104.0	WAP000970	WRM380437
100.0	112.2	7.1	106.0	WAP001000	WRM393440
101.0	111.0	5.3	105.0	WAP001010	WRM397437
103.0	115.2	7.1	109.0	WAP001030	WRM405452
104.0	116.2	7.1	110.0	WAP001040	WRM409457
105.0	117.2	7.1	111.0	WAP001050	WRM413460
110.0	122.2	7.1	116.0	WAP001100	WRM433480
115.0	127.2	7.1	121.0	WAP001150	WRM452500
116.0	128.2	7.1	121.0	WAP001160	WRM456504
116.0	130.2	7.1	123.0	WAP101160	WRM456511
118.0*	130.2	7.1	124.0	WAP001180	WRM464511
120.0	128.6	5.3	123.0	WAP001200	WRM472504
120.0	132.2	7.1	126.0	WAP101200	WRM472519
121.0*	131.0	5.3	125.0	WAP001210	WRM476515
125.0	137.2	7.1	131.0	WAP001250	WRM492539
127.0	135.6	5.3	132.0	WAP001270	WRM500531
127.0	139.2	7.1	133.0	WAP101270	WRM500550
130.0	142.2	7.1	136.0	WAP001300	WRM511559
135.0	147.2	7.1	141.0	WAP001350	WRM531578
135.0	149.2	7.1	142.0	WAP101350	WRM531582
140.0	152.2	7.1	146.0	WAP001400	WRM551598
140.0	155.2	10.1	147.0	WAP101400	WRM551610
145.0	157.2	7.1	151.0	WAP001450	WRM570618
146.0*	158.0	6.3	152.0	WAP001460	WRM575622/1
146.05	158.25	7.1	152.05	WAP001461	WRM575622
150.0*	162.2	7.1	156.0	WAP001500	WRM590637
155.0	169.2	7.1	162.0	WAP001550	WRM610664
160.0	168.6	5.3	163.0	WAP001600	WRM629661
160.0	175.2	10.1	168.0	WAP101600	WRM629688
165.0	173.6	5.3	168.0	WAP001650	WRM649681
165.0	177.2	7.1	171.0	WAP101650	WRM649698
170.0	180.6	5.3	174.0	WAP001700	WRM669708
170.0	185.2	10.1	178.0	WAP101700	WRM669728
171.0	183.0	6.3	176.0	WAP001710	WRM673720
175.0	189.2	7.1	182.0	WAP001750	WRM688744
180.0	195.2	10.1	188.0	WAP001800	WRM708767
187.0*	195.6	5.3	190.0	WAP001870	WRM736768
196.0	210.2	7.1	203.0	WAP001960	WRM771826

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	TSS Part No.	Description
d_N f8/h9	D_3 H9	L3 +0.2	D_4 +0.2		
197.0	219.0	6.3	202.0	WAP001970	WRM775823
200.0	215.2	10.1	207.0	WAP002000	WRM787847
210.0	224.2	7.1	217.0	WAP002100	WRM826883
210.0	225.0	7.0	217.0	WAP102100	WRM826885
219.5	233.7	7.1	226.5	WAP002195	WRM860919
223.0	235.0	6.3	228.0	WAP002230	WRM878925
244.5	258.7	7.1	251.5	WAP002445	WRM9621017
249.0	261.0	6.3	254.0	WAP002490	WRM9801027
260.0	275.2	10.1	268.0	WAP002600	WRM10241078

* Available upon request

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Zurcon® Scraper ASW

Single-acting

Material:
Zurcon®

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Zurcon® Scraper ASW

Description

The scraper ASW is a single-acting polyurethane scraper.

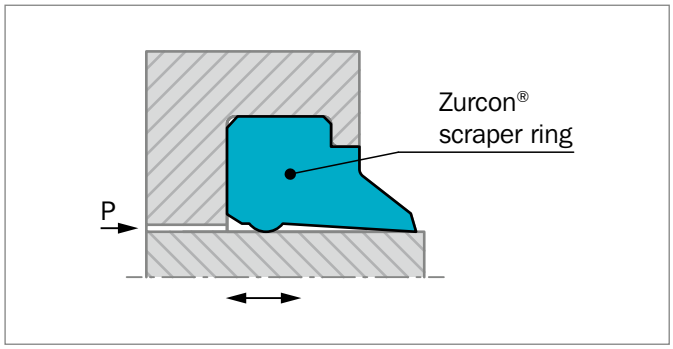

Figure 195: Scraper ASW

The special feature of this scraper is an additional supporting bead on the inner surface. It prevents tilting or twisting of the scraper in the groove. At the same time this support improves the firm seating in the groove, thus preventing the penetration of impurities via the back of the scraper. This represents a technical improvement compared with similar scraper types.

ADVANTAGES

- Simple groove design
- Very good scraping effect, wear resistant
- No tilting or twisting in the groove
- Simple installation
- Flush fitting with the outer surface

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-35 °C to +100 °C
Media:	Mineral oil-based hydraulic fluids

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIAL

The standard material is a wear resistant Zurcon® polyurethane.

Standard material:	Polyurethane, 92 Shore A Material No. Z201
Color:	Turquoise

■ Installation Recommendation

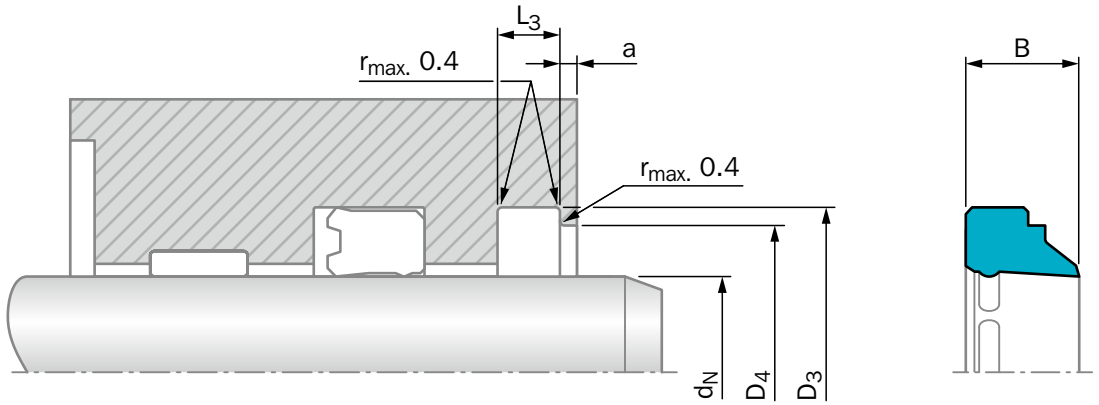

Figure 196: Installation Drawing

ORDERING EXAMPLE

Scraper ASW

Rod Diameter:	d_N = 50.0 mm
TSS Part No.:	WSW000500 from Table 174
Material:	Z201

TSS Article No. **WSW0 0 0500 - Z201**

TSS Series No.
Type (Standard)
Rod Diameter x 10
Quality Index (Standard)
Material Code

Table 174: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	Step Width	Width	TSS Part No.
d_N f8/h9	D_3 H9	L_3 +0.2	D_4 H11	a min	B	
6.0	**10.0**	**2.0**	**9.0**	**1.0**	**4.0**	**WSW000060**
8.0	**14.0**	**2.6**	**12.0**	**1.0**	**5.0**	**WSW000080**
10.0	**16.0**	**2.6**	**14.0**	**1.0**	**5.0**	**WSW000100**
12.0	**18.0**	**2.6**	**16.0**	**1.0**	**5.0**	**WSW000120**
14.0	**20.0**	**2.6**	**18.0**	**1.0**	**5.0**	**WSW000140**
14.0	**22.0**	**4.0**	**20.0**	**1.0**	**7.0**	**WSW100140**
15.0	23.0	4.0	21.0	1.0	7.0	WSW000150
16.0	**24.0**	**4.0**	**22.0**	**1.0**	**7.0**	**WSW000160**
18.0	**26.0**	**4.0**	**24.0**	**1.0**	**7.0**	**WSW000180**
20.0	**26.0**	**2.6**	**24.0**	**1.0**	**5.0**	**WSW100200**
20.0	**28.0**	**4.0**	**26.0**	**1.0**	**7.0**	**WSW000200**
22.0	**30.0**	**4.0**	**28.0**	**1.0**	**7.0**	**WSW000220**

Rod Diameter	Groove Diameter	Groove Width	Bore Diameter	Step Width	Width	TSS Part No.
d_N f8/h9	D_3 H9	L_3 +0.2	D_4 H11	a min	B	
24.0	32.0	4.0	30.0	1.0	7.0	WSW000240
25.0	**33.0**	**4.0**	**31.0**	**1.0**	**7.0**	**WSW000250**
28.0	**36.0**	**4.0**	**34.0**	**1.0**	**7.0**	**WSW000280**
30.0	38.0	4.0	36.0	1.0	7.0	WSW000300
32.0	**40.0**	**4.0**	**38.0**	**1.0**	**7.0**	**WSW000320**
34.0	42.0	4.0	40.0	1.0	7.0	WSW000340
35.0	43.0	4.0	41.0	1.0	7.0	WSW000350
36.0	**44.0**	**4.0**	**42.0**	**1.0**	**7.0**	**WSW000360**
38.0	46.0	4.0	44.0	1.0	7.0	WSW000380
40.0	**48.0**	**4.0**	**46.0**	**1.0**	**7.0**	**WSW000400**
42.0	50.0	4.0	48.0	1.0	7.0	WSW000420
45.0	**53.0**	**4.0**	**51.0**	**1.0**	**7.0**	**WSW000450**
50.0	**58.0**	**4.0**	**56.0**	**1.0**	**7.0**	**WSW000500**
52.0	60.0	4.0	58.0	1.0	7.0	WSW000520
55.0	63.0	4.0	61.0	1.0	7.0	WSW000550
56.0	**64.0**	**4.0**	**62.0**	**1.0**	**7.0**	**WSW000560**
60.0	68.0	4.0	66.0	1.0	7.0	WSW000600
63.0	**71.0**	**4.0**	**69.0**	**1.0**	**7.0**	**WSW000630**
65.0	73.0	4.0	71.0	1.0	7.0	WSW000650
70.0	**78.0**	**4.0**	**76.0**	**1.0**	**7.0**	**WSW000700**
75.0	83.0	4.0	81.0	1.0	7.0	WSW000750
80.0	**88.0**	**4.0**	**86.0**	**1.0**	**7.0**	**WSW000800**
85.0	93.0	4.0	91.0	1.0	7.0	WSW000850
90.0	**98.0**	**4.0**	**96.0**	**1.0**	**7.0**	**WSW000900**
100.0	**108.0**	**4.0**	**106.0**	**1.0**	**7.0**	**WSW001000**
105.0	113.0	4.0	111.0	1.0	7.0	WSW001050
110.0	**122.0**	**5.5**	**119.0**	**1.5**	**10.0**	**WSW001100**
120.0	132.0	5.5	129.0	1.5	10.0	WSW001200
125.0	**137.0**	**5.5**	**134.0**	**1.5**	**10.0**	**WSW001250**
140.0	**152.0**	**5.5**	**149.0**	**1.5**	**10.0**	**WSW001400**
150.0	162.0	5.5	159.0	1.5	10.0	WSW001500
160.0	**172.0**	**5.5**	**169.0**	**1.5**	**10.0**	**WSW001600**

The rod diameters in **bold** type comply with the recommendations of ISO 3320.
Other dimensions on request.
A split groove is required up to 14 mm diameter.

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Zurcon® Scraper WNV

Double-acting

Material:
Zurcon®

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■ Zurcon® Scraper WNV

■ Description

WNV is a double acting scraper in material Zurcon® polyurethane Z 201. The dynamic scraping lip is specially designed with an additional inwards sealing edge to keep the residual oil film in the system. If the volume of this oil film can not be backpumped by the main rod seal (e.g. u.cup) a pressure built up between u-cup and scraper will be prevented by releasing this pressure by liftening of the scraper lip.

The static sealing lip and edge respectively ensure against the intrusion of dirt and fluids (e.g. water) over the outer diameter of the scraper. The support on the reverse side of the scraper prevents it from twisting in the groove.

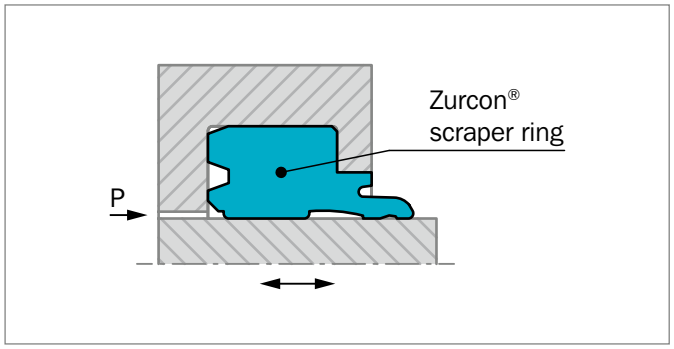

Figure 197: Scraper WNV

ADVANTAGES

- Double acting
- Pressure release function
- Good static sealing performance due to additional seal lip at the housing
- Stable position of scraper in the housing
- Support bead with notches to support release function
- Housings in accordance to ISO 6195 type A

APPLICATION EXAMPLES

- Mobile hydraulic machinery
- ISO-standard cylinders application
- Agriculture machinery
- Lift trucks
- Cargo tailboards
- Steering cylinders

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-35 °C to +100 °C
Media:	Mineral oil based hydraulic fluids
Groove Type:	Closed

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Standard application:

Zurcon® Polyurethane:	92 Shore A
Material code:	Z201
Color:	Turquoise

■ Installation Recommendation

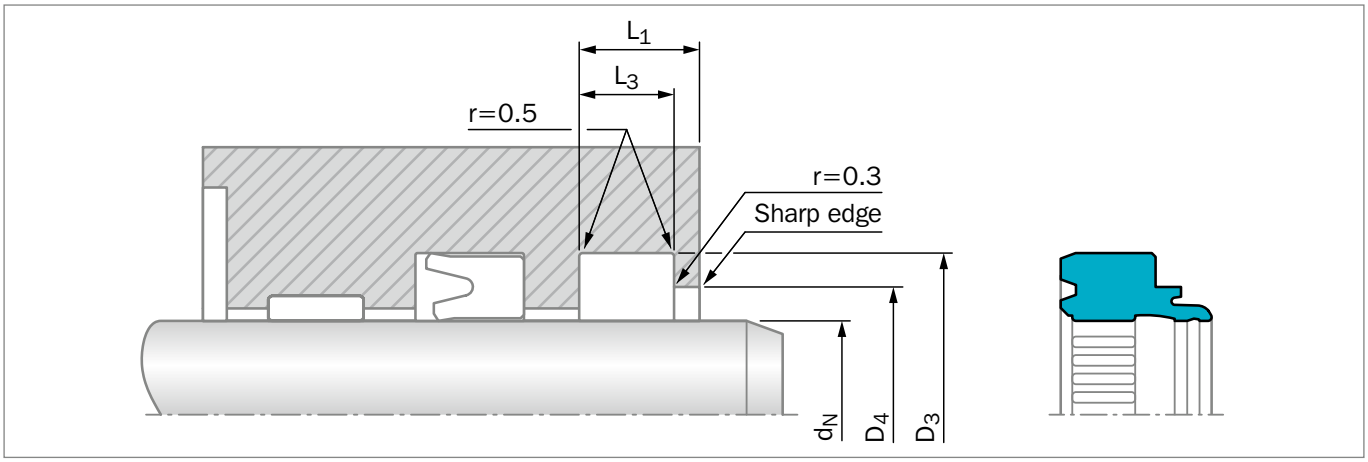

Figure 198: Installation Drawing

ORDERING EXAMPLE

Rod Diameter:	d_N = 45.0 mm
Groove Diameter:	D_3 = 53.0 mm
TSS Part No.:	WNV000450 from Table 175
Material Code:	Z201

TSS Article No. WNV0 0 0450 - Z201

- TSS Series No.
- Type (Standard)
- Rod Diameter x 10
- Quality Index (Standard)
- Material Code

Table 175: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Bore Diameter	Groove Width	Depth	TSS Part No.
d_N h9	D_3 H8	D_4 H8	L_3 +0.2	L_1 +0.2	
16	24	21.5	5.0	7.0	WNV000160
18	26	23.5	5.0	7.0	WNV000180
20	28	25.5	5.0	7.0	WNV000200
25	33	30.5	5.0	7.0	WNV000250
30	38	35.5	5.0	7.0	WNV000300
32	40	37.5	5.0	7.0	WNV000320
35	43	40.5	5.0	7.0	WNV000350
40	48	45.5	5.0	7.0	WNV000400
45	53	50.5	5.0	7.0	WNV000450
50	58	55.5	5.0	7.0	WNV000500
60	68	65.5	5.0	7.0	WNV100600
70	80	77	6.3	8.3	WNV000700
80	90	87	6.3	8.3	WNV000800
100	115	110	9.5	12	WNV001000

Scraper WSA

Single-acting

With Metal Case

For open Groove Assembly

Material:
NBR and Metal

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Scraper WSA

Description

The scraper WSA is a mold-vulcanised single-acting elastomer scraper, with integral metal reinforcement for open groove assembly. In conjunction with the scraper oversize, an exact fit is obtained in the housing.

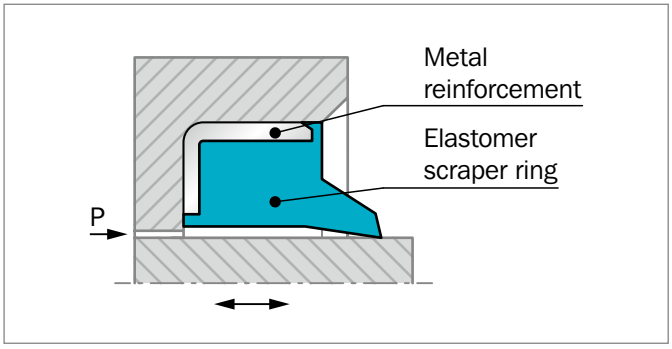

Figure 199: Scraper WSA

ADVANTAGES

- Space-saving construction
- Low cost, economical solution
- Simple, easy-construction groove
- Firm fit in the groove due to metallic press fit

APPLICATION EXAMPLES

- Hydraulic cylinders
- Agriculture machinery
- Construction machinery
- Lift trucks
- Mobile hydraulic

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-30 °C to +110 °C
Media:	Mineral oil based hydraulic fluids. polyglycol-water emulsions, water-oil emulsions
Groove Type:	Open

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Standard application:

Material: NBR 90 Shore A + Metal

TSS code: N9MN

■ Installation Recommendation

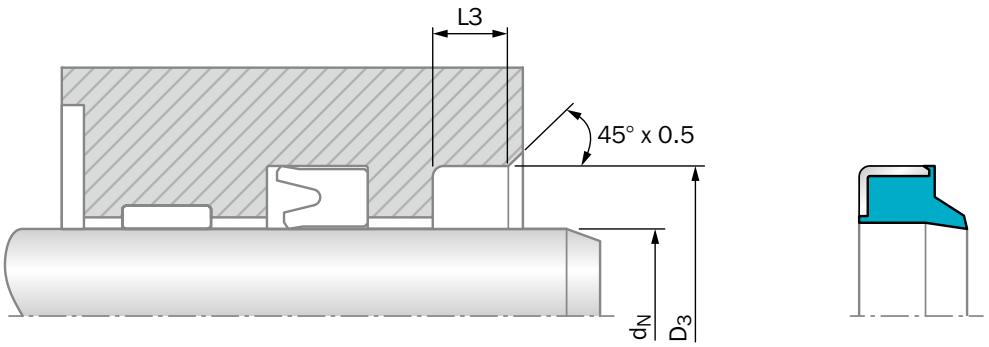

Figure 200: Installation Drawing

ORDERING EXAMPLE

Rod Diameter:	d_N = 35 mm
Groove Diameter:	D_3 = 45 mm
TSS Part No.:	WSA000350 from Table 176
Material Set-Code:	N9MN

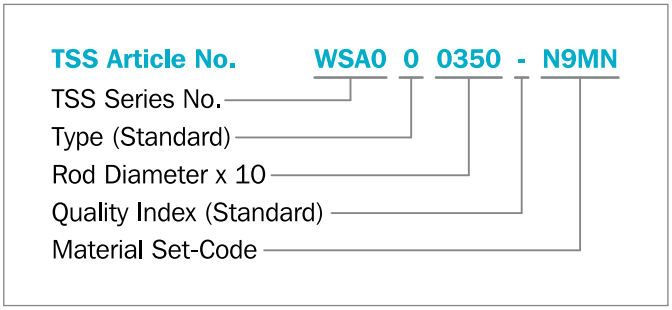

Table 176: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N h9	**D_3** H8	**L_3** +0.2	
6.0	13.0	3.0	WSA000060
8.0	15.0	3.0	WSA000080
10.0	16.0	3.0	WSA000100
10.0	**18.0**	**5.0**	**WSA100100**
12.0	18.0	5.0	WSA200120
12.0	20.0	4.0	WSA000120
12.0	22.0	5.0	WSA100120
13.0	18.0	3.0	WSA000130
14.0	20.0	4.0	WSA100140
14.0	22.0	3.0	WSA000140
16.0	22.0	4.0	WSA000160
16.0	26.0	5.0	WSA200160
16.0	28.0	5.0	WSA300160
18.0	26.0	5.0	WSA000180

Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N h9	D_3 H8	L_3 +0.2	
18.0	28.0	5.0	WSA300180
18.0	**28.0**	**7.0**	**WSA100180**
20.0	26.0	4.0	WSA000200
20.0	28.0	3.5	WSA200200
20.0	28.0	5.0	WSA300200
20.0	30.0	4.0	WSA400200
20.0	30.0	5.0	WSA500200
20.0	**30.0**	**7.0**	**WSA600200**
22.0	28.0	5.0	WSA000220
22.0	32.0	5.0	WSA200220
22.0	**32.0**	**7.0**	**WSA100220**
24.0	35.0	5.0	WSA000240
25.0	36.5	5.0	WSA200250
25.0	35.0	5.0	WSA000250
25.0	**35.0**	**7.0**	**WSA100250**
28.0	38.0	5.0	WSA000280
28.0	40.0	7.0	WSA100280
30.0	40.0	5.0	WSA000300
30.0	40.0	7.0	WSA100300
30.0	45.0	5.0	WSA200300
32.0	42.0	5.0	WSA000320
32.0	42.0	7.0	WSA400320
32.0	44.0	4.0	WSA300320
32.0	45.0	4.0	WSA100320
32.0	45.0	7.0	WSA200320
35.0	45.0	7.0	WSA000350
36.0	45.0	7.0	WSA000360
38.0	48.0	7.0	WSA000380
40.0	50.0	5.0	WSA100400
40.0	50.0	5.0	WSA000400
40.0	**50.0**	**7.0**	**WSA200400**
42.0	52.0	7.0	WSA000420
45.0	55.0	5.0	WSA100450
45.0	**55.0**	**7.0**	**WSA000450**
50.0	56.0	5.0	WSA000500
50.0	60.0	5.0	WSA200500
50.0	60.0	5.0	WSA500500
50.0	**60.0**	**7.0**	**WSA300500**
50.0	65.0	7.0	WSA400500
52.0	62.0	7.0	WSA000520
55.0	63.0	7.0	WSA000550
55.0	65.0	5.0	WSA200550

Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N h9	D_3 H8	L_3 +0.2	
55.0	65.0	7.0	WSA100550
55.0	70.0	7.0	WSA300550
56.0	**66.0**	**7.0**	**WSA000560**
60.0	70.0	5.0	WSA200600
60.0	70.0	7.0	WSA000600
60.0	74.0	5.0	WSA100600
63.0	75.0	7.0	WSA000630
65.0	75.0	5.0	WSA100650
65.0	75.0	7.0	WSA000650
70.0	80.0	5.0	WSA100700
70.0	**80.0**	**7.0**	**WSA000700**
75.0	83.0	7.0	WSA100750
75.0	85.0	7.0	WSA000750
80.0	88.0	7.0	WSA100800
80.0	**90.0**	**7.0**	**WSA000800**
85.0	95.0	7.0	WSA000850
90.0	**100.0**	**7.0**	**WSA000900**
95.0	105.0	7.0	WSA000950
100.0	110.0	7.0	WSA001000
105.0	115.0	7.0	WSA001050
110.0	120.0	7.0	WSA001100
115.0	125.0	7.0	WSA001150
120.0	130.0	7.0	WSA001200
120.0	135.0	7.0	WSA101200
125.0	**140.0**	**9.0**	**WSA001250**
130.0	145.0	9.0	WSA001300
135.0	145.0	7.0	WSA001350
140.0	**155.0**	**9.0**	**WSA001400**
140.0	160.0	10.0	WSA101400
150.0	165.0	9.0	WSA001500
160.0	**175.0**	**9.0**	**WSA001600**
170.0	185.0	10.0	WSA001700
175.0	190.0	9.0	WSA001750
180.0	195.0	10.0	WSA001800
200.0	220.0	12.0	WSA002000
220.0	235.0	10.0	WSA002200
270.0	295.0	12.0	WSA002700

The sizes in **bold** type comply with ISO 6195. installation groove Type B. Other sizes on request.
The listed products are technically equivalent but availability and pricing may vary.

Zurcon® Scraper SWP

Single-acting

Metal Reinforcement

For open Groove Assembly

Material:
Zurcon® + Metal

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■ Zurcon® Scraper SWP

■ Description

SWP are polyurethane manufactured lipped wipers with integrated metal reinforcement for open groove assembly. These are typically used in severe applications where there is abrasion due to solid matter on rod surface.

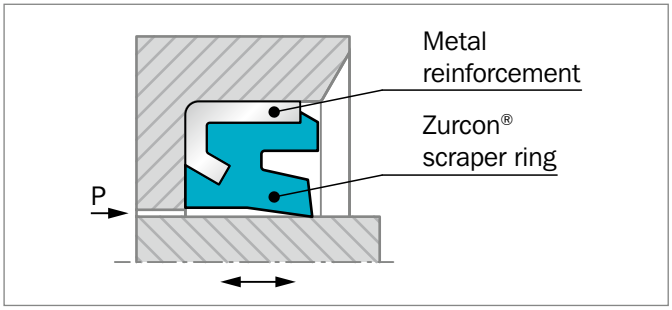

Figure 201: Scraper SWP

ADVANTAGES

- Space-saving construction
- Simple small installation groove
- Firm fit in the groove due to metallic press fit
- At regreasing of drag bearing, the scraper lip opens at low overpressure; old grease can escape
- High wear resistance

APPLICATION EXAMPLES

Due to their outstanding wiping capacities SWP scrapers are recommended wherever there are dusty and humid conditions and especially for the following applications:

- Mobile hydraulic machinery
- Construction machinery
- Link pin seals
- Lift trucks
- Truck cargo cranes
- Agriculture machinery

OPERATING CONDITIONS

Speed:	Up to 1 m/s
Temperature:	-35 °C to +100 °C
Media:	Mineral oil based hydraulic fluids
Groove Type:	Open

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Standard application

Zurcon® Polyurethane:	92 Shore A
Color:	Turquoise
Metal case:	non alloyed steel DIN 1624
Material Set-Code:	Z2022

■ Installation Recommendation

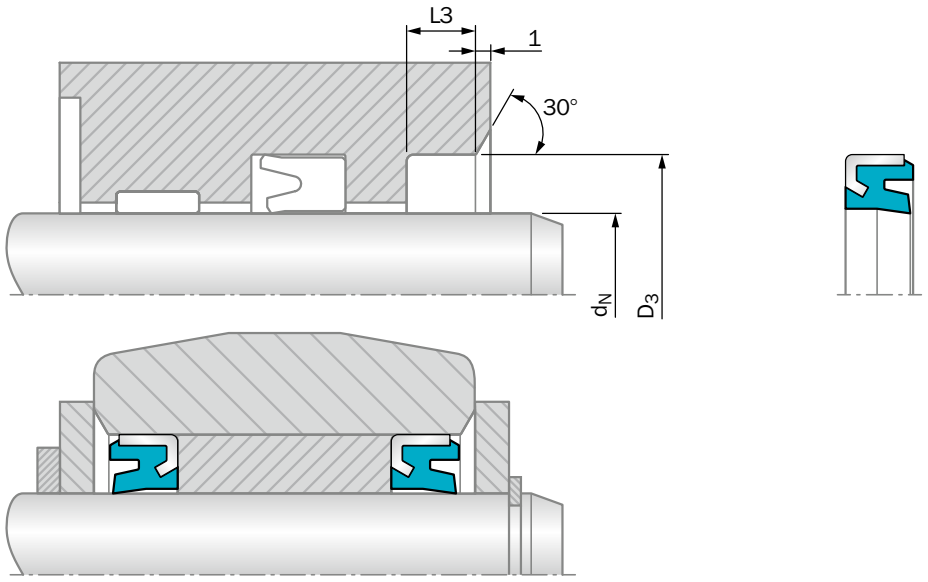

Figure 202: Installation Drawing

ORDERING EXAMPLE

Rod Diameter:	d_N = 40 mm
Groove Diameter:	D_3 = 50 mm
TSS Part No.:	WSP000400 from Table 177
Material Set-Code:	Z2022 (standard)
Polypac Ref.:	SWP 4050

TSS Article No. WSP0 0 0400 - Z2022

- TSS Series No.
- Type (Standard)
- Rod Diameter x 10
- Quality Index (Standard)
- Material Set-Code

Table 177: Installation Dimensions / TSS Part Numbers

Rod Diameter	Groove Diameter	Groove Width	TSS Part No.	Description
d_N h9	**D_3** H8	**L3** +0.2		
25.0	38.0	7.5	WSP000250	SWP2538
30.0	40.0	4.0	WSP000300	*SWP3040
35.0	50.0	7.5	WSP100350	SWP3550
36.0	48.0	6.0	WSP000360	SWP3648
40.0	50.0	4.0	WSP000400	*SWP4050
40.0	52.0	6.0	WSP100400	SWP4052
45.0	55.0	3.2	WSP000450	*SWP4555/1
45.0	55.0	4.0	WSP100450	*SWP4555
45.0	60.0	7.5	WSP200450	SWP4560

Rod Diameter d_N h9	Groove Diameter D_3 H8	Groove Width L3 +0.2	TSS Part No.	Description
50.0	60.0	4.0	WSP000500	*SWP5060
50.0	63.0	4.0	WSP100500	*SWP5063
50.0	65.0	7.5	WSP200500	SWP5065
55.0	65.0	3.2	WSP000550	*SWP5565
55.0	68.0	4.0	WSP100550	*SWP5568
56.0	70.0	7.5	WSP000560	SWP5670
60.0	75.0	4.0	WSP000600	*SWP6075/1
60.0	75.0	7.5	WSP100600	SWP6075
63.0	78.0	7.5	WSP000630	SWP6378
65.0	80.0	5.0	WSP000650	*SWP6580/1
65.0	80.0	7.5	WSP100650	SWP6580
70.0	80.0	5.0	WSP000700	*SWP7080
70.0	84.0	8.0	WSP100700	SWP7084
70.0	85.0	4.0	WSP200700	SWP7085/1
70.0	85.0	7.5	WSP300700	SWP7085
75.0	90.0	7.5	WSP000750	SWP7590
75.0	95.0	10.0	WSP100750	SWP7595
80.0	95.0	5.0	WSP000800	*SWP8095/1
80.0	95.0	7.5	WSP100800	SWP8095
80.0	100.0	10.0	WSP200800	SWP80100
85.0	100.0	4.0	WSP000850	*SWP85100/1
85.0	100.0	10.0	WSP100850	SWP85100
85.0	105.0	10.0	WSP200850	SWP85105
90.0	104.0	8.0	WSP000900	SWP90104
90.0	105.0	6.0	WSP100900	*SWP90105
90.0	110.0	10.0	WSP200900	SWP90110
95.0	115.0	10.0	WSP000950	SWP95115
99.0	115.0	7.5	WSP000990	SWP99115
100.0	115.0	4.0	WSP001000	*SWP100115/2
100.0	115.0	7.5	WSP201000	SWP100115
100.0	120.0	10.0	WSP301000	SWP100120
110.0	125.0	4.0	WSP001100	SWP110125/1
110.0	125.0	9.0	WSP101100	SWP110125
110.0	130.0	10.0	WSP201100	SWP110130
115.0	130.0	9.0	WSP101150	SWP115130/1
120.0	140.0	10.0	WSP001200	SWP120140
130.0	145.0	7.5	WSP001300	SWP130145
160.0	175.0	10.0	WSP001600	SWP160175
190.0	210.0	10.0	WSP001900	SWP190210

* Can be used for "Link Pin Seal"

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Metal Scraper

Single-acting

Metal and Elastomer Scrapers Lips

Material:
NBR, Metal and Brass

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■ Metal Scraper

■ Description

The metal scraper is a single-acting special scraper with two different scraper lips - a thin metallic lip and a elastomer lip. The two scraper lips are arranged in tandem behind one another in a compact metal housing.

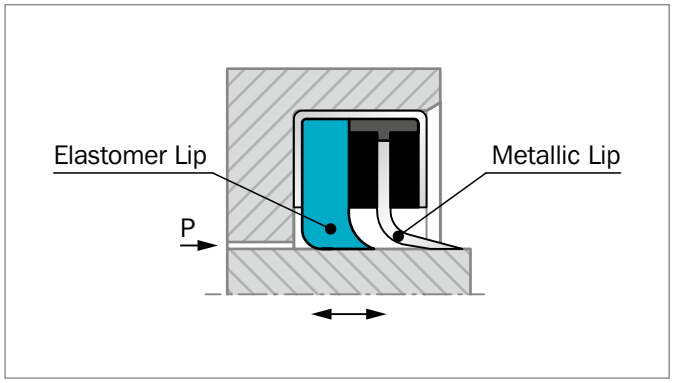

Figure 203: Metal Scraper

The metal scraper lip is designed to remove firmly adhering soiling and ice particles. The secondary lip of elastomer material enhances the overall scraping effect, i.e. fine sand grains, water and similar foreign matter are reliably scraped off. Both scraper lips have a smaller diameter than the nominal diameter of the piston rod, thus ensuring a tight fit of the scraper lips. The metallic lip is guided flexibly in radial direction and can easily follow any possible deflections of the piston rod.

ADVANTAGES

- Very good scraping effect, even with firmly adhering dirt, e.g. mud, ice
- Very abrasion resistant
- Tight fit in the groove due to the metal case
- Easy installation in open grooves

OPERATING CONDITIONS

Speed:	Max. 1 m/s with reciprocating movements
Temperature:	-30 °C to +110 °C
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids (HFA, HFB, HFC), water, air, etc.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

Inner scraper lip: Acrylonitrile butadiene rubber, NBR 70 Shore A Code N7

Metal housing: Sheet metal 1.0204 (AISI 1008) or similar Code M

Outer scraper lip: Brass Code S

Other materials for scraper lips and housing available on request. Also available in an imperial (inch) size range.

■ Installation Recommendation

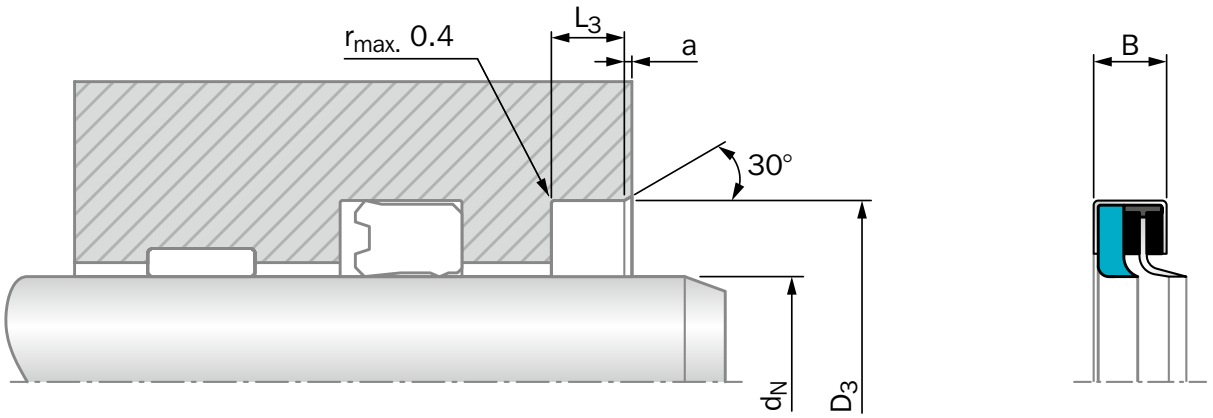

Figure 204: Installation Drawing

ORDERING EXAMPLE

Metal Scraper

Rod Diameter:	d_N = 80.00 mm
Groove Diameter:	D_3 = 96.00 mm
Groove Width:	L_3 = 8.50 mm
TSS Part No.:	WM0100800 from Table 178
Material:	Standard materials Material code N7MS

TSS Article No. **WM01 00800 - N7 M S**

- WM01 — TSS Series No.
- 00800 — Rod Diamter x 10
- \- — Quality index (Standard)
- N7 — Material Code (Inner Scraper Lip)
- M — Material Code (Housing)
- S — Material Code (Outer Scraper Lip)

Table 178: Installation Dimensions / TSS Part Numbers

Rod Diameter	Groove Diameter	Groove Width	Chamfer	Width	TSS Part No.
d_N f8/h9	D_3 H8	L_3 +0.2	a min.	B	
12.0	**25.0**	**7.0**	**2.0**	**6.5**	**WM0000120**
14.0	**27.0**	**7.0**	**2.0**	**6.5**	**WM0000140**
15.0	28.0	7.0	2.0	6.5	WM0000150
16.0	**29.0**	**7.0**	**2.0**	**6.5**	**WM0000160**
18.0	**31.0**	**7.0**	**2.0**	**6.5**	**WM0000180**
20.0	**33.0**	**7.0**	**2.0**	**6.5**	**WM0000200**
22.0	**35.0**	**7.0**	**2.0**	**6.5**	**WM0000220**
25.0	**38.0**	**7.0**	**2.0**	**6.5**	**WM0000250**
28.0	**41.0**	**7.0**	**2.0**	**6.5**	**WM0000280**
30.0	43.0	7.5	2.0	7.0	WM0000300
32.0	**45.0**	**7.5**	**2.0**	**7.0**	**WM0000320**
35.0	48.0	7.5	2.0	7.0	WM0000350
36.0	**49.0**	**7.5**	**2.0**	**7.0**	**WM0000360**
38.0	51.0	7.5	2.0	7.0	WM0000380
40.0	**53.0**	**7.5**	**2.0**	**7.0**	**WM0200400**
45.0	**58.0**	**7.5**	**2.0**	**7.0**	**WM0000450**
50.0	**64.0**	**8.0**	**2.0**	**7.5**	**WM0000500**
55.0	69.0	8.0	2.0	7.5	WM0000550
58.0	72.0	8.0	2.0	7.5	WM0000580
60.0	74.0	8.0	2.0	7.5	WM0000600
63.0	**77.0**	**8.0**	**2.0**	**7.5**	**WM0000630**
65.0	79.0	8.0	2.0	7.5	WM0000650
70.0	**84.0**	**8.0**	**2.0**	**7.5**	**WM0000700**
75.0	89.0	8.0	2.0	7.5	WM0000750
80.0	**96.0**	**8.5**	**2.0**	**8.0**	**WM0100800**
85.0	101.0	8.5	2.0	8.0	WM0000850
90.0	**106.0**	**8.5**	**2.0**	**8.0**	**WM0000900**
95.0	111.0	8.5	2.0	8.0	WM0000950
100.0	**120.0**	**9.0**	**3.0**	**8.5**	**WM0001000**
110.0	**130.0**	**9.0**	**3.0**	**8.5**	**WM0001100**
120.0	140.0	9.0	3.0	8.5	WM0001200
130.0	150.0	9.0	3.0	8.5	WM0001300
140.0	**160.0**	**9.0**	**3.0**	**8.5**	**WM0001400**
150.0	170.0	9.0	3.0	8.5	WM0101500
160.0	**180.0**	**9.0**	**3.0**	**8.5**	**WM0001600**
170.0	190.0	9.0	3.0	8.5	WM0001700
180.0	**200.0**	**12.0**	**3.0**	**10.0**	**WM0001800**
200.0	**230.0**	**12.0**	**3.0**	**10.0**	**WM0102000**
210.0	230.0	12.0	3.0	10.0	WM0002100
220.0	**250.0**	**12.0**	**3.0**	**10.0**	**WM0002200**

The rod diameters in **bold** type comply with the recommendations of ISO 3320.
Other sizes on request.
Inch sizes can be supplied.

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Turcon® Variseal® M2S

Single-acting

Spring-energized plastic U-Cup

Material:
Turcon® and Zurcon®

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Turcon® Variseal® M2S

■ Description

Turcon® Variseal® M2S is a single-acting seal consisting of a U-shaped jacket and a V-shaped corrosion resistant spring. Variseal® M2S has an asymmetric seal profile. The dynamic lip is optimized, offering long service life and a good scraping ability even in media with high viscosity.

Unlike other scrapers the Variseal® M2S offers a functional combination of scraper and seal in one.

The spring cavity can be filled with high temperature HiClean silicone to prevent contamination blocking the cavity.

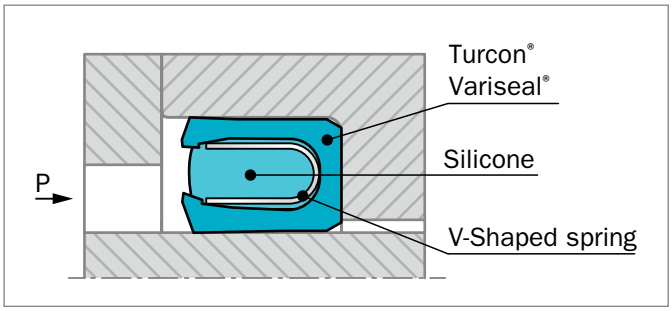


Figure 205: Turcon® Variseal® M2S

AREAS OF APPLICATION

- Marine environments, able to scrape marine growth
- Subsea environments with high temperature application
- High speed hydraulics in dirty environments
- High temperature applications
- Low temperature and cryogenic applications
- Chemical plant where the lack of any elastomer is a benefit
- Food & Pharmaceutical application where the HiClean version has minimal entrapment areas and is resistant to many CIP/SIP fluids

ADVANTAGES

- Suitable for reciprocating and light duty rotary movement
- Excellent scraping ability
- Combined scraping and sealing function
- High abrasion resistance
- Turcon has resistance to most fluids and chemicals
- Excellent resistance to aging
- Available for diameters from 3 to 3,200 mm
- Dimensionally stable
- Outstanding sliding and stick-slip properties

OPERATING CONDITIONS

Pressure:	Maximum dynamic load: 20 MPa Maximum static load: 40 MPa (207 MPa with customs designs)
Speed:	Reciprocating up to 15 m/s in T40 up to 2 m/s in Z80 Rotating up to 1.27 m/s in T40
Temperature:	-50 °C to +260 °C in T40 -45 °C to +260 °C in T40 with HiClean -50 °C to +80 °C in Z80 -196 °C custom design option available
Media:	Fluids of medium to high viscosity or containing hard particles

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time. e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. Temperature range also depends on media.

MATERIALS

All materials used are physiologically safe. They contain no odour or taste-affecting substances.

The following material combination has proved effective for most fluid applications:

Seal ring: Turcon® T40

Spring: Stainless steel, Material No. AISI 301
Material code S

For gas applications use:

Seal ring: Zurcon® Z80

For use in accordance with the demands of the Food and Drug Administration, suitable materials are available on request.

Table 179: Turcon® and Zurcon® Materials for Variseal® M2S

Material Code Material Description	Operating Temperature* °C	Mating Surface Material	MPa max.
Turcon® T40 High-grade formulation of virgin polytetrafluoroethylene (PTFE) based material compounded with carbon fiber additive. Excellent wear and low friction characteristics. Suited to reciprocating and rotary applications. Suitable for use in media with poor lubricating properties and for dry-running situations. Color: Black / gray	-60 to +300	Steel, hardened Steel, chromeplated	40
Zurcon® Z80 UHMW Polyethylene. Excellent wear and abrasion resistance. Very good lubricity in water based media. Color: Translucent white	-253 to +80	Steel Steel, chromeplated Stainless steel Aluminum Bronze Ceramic coating	40

SPRING MATERIALS

The standard spring material for Turcon® Variseal® is stainless steel (spring code S). Two further materials are available for the specific applications, as detailed in the table below.

Table 180: Spring Material

Media	Spring Materials	Spring Order Code
For General use e.g. Oil Grease Air Water, steam Solvents Food, drugs Gas	**Stainless steel** DIN Mat No. 1.4310/1.4319 AISI 301/302 UNS 30100	S (Standard spring material)
For use in corrosive media e.g. Acids Caustics Seawater	**Hastelloy® C-276** DIN Mat No. 2.4819 UNS N10276	H
For petrochemical use e.g. Crude oil Sour gas	**Elgiloy® 1)** DIN Mat No. 2.4711 UNSR30003	E

Hastelloy® is a registered trademark of Haynes International, Inc.

Elgiloy® is a registered trademark of the Elgiloy Specialty Metals.

Alternative brand may be used.

1) NACE-approval

■ Groove Design

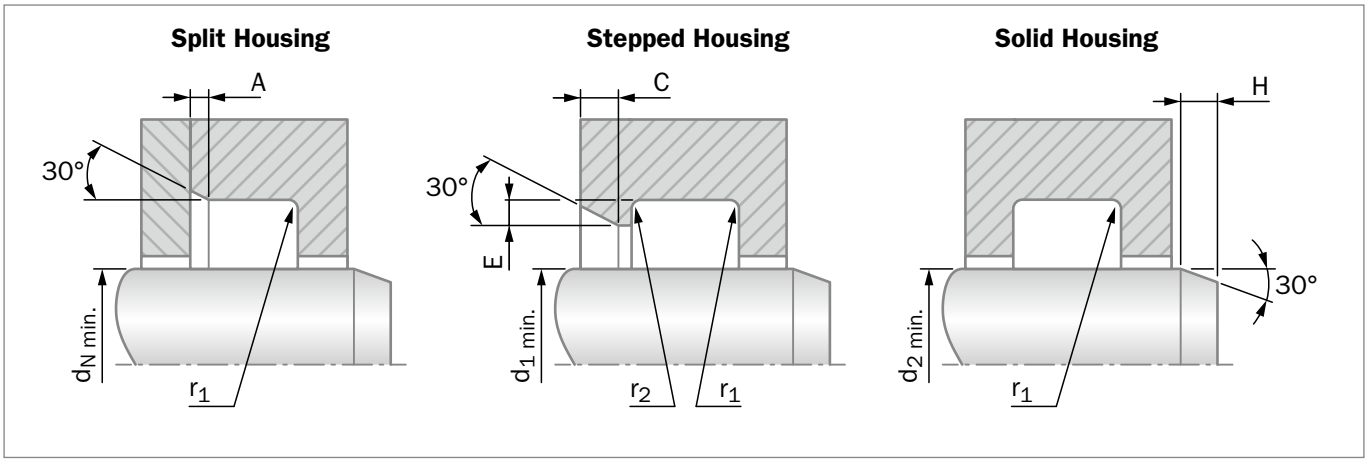


Figure 206: Variseal Groove Configurations

Installation lead-in chamfers and steps to include blend radii and are to be polished.

Table 181: Dimensions for Groove Designs

Series	Rod Groove Dimensions					
	A Chamfer	r_1 Maximum Radius	C Minimum Chamfer	r_2 Maximum Radius	E Minimum Step Height	H Minimum Chamfer
000	0.25 / 0.38	0.25	0.70	0.13	0.40	1.20
100	0.38 / 0.51	0.38	1.10	0.13	0.60	1.50
200	0.38 / 0.51	0.38	1.25	0.18	0.70	2.50
300	0.51 / 0.69	0.38	1.40	0.25	0.80	4.50
400	0.51 / 0.69	0.51	1.60	0.25	0.90	6.00
500	0.76 / 1.02	0.51	2.60	0.38	1.50	11.00

Table 182: Groove Design for Rod

Series	Rod Diameter Recommendations		
	Split Groove Ø d_N Minimum	Stepped Groove Ø d_1 Minimum	Solid Groove Ø d_2 Minimum
000	3.00	20.00	31.75
100	6.00	30.00	69.85
200	10.00	35.00	111.13
300	20.00	40.00	298.45
400	35.00	45.00	495.30
500	80.00	80.00	762.00

■ Installation Recommendation

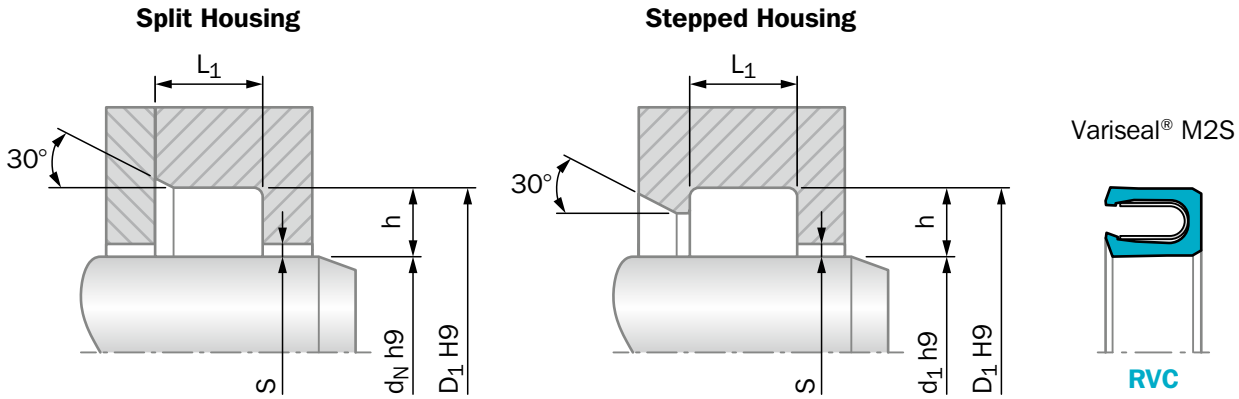


Figure 207: Installation Drawing

Table 183: Installation Dimensions

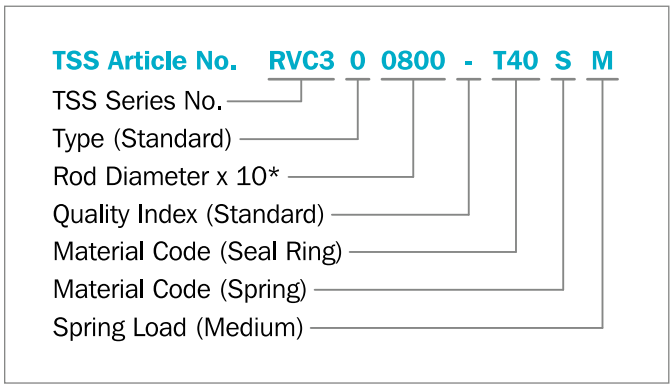
Series No.	Rod Diameter d_N / d_1 h9		Groove Depth	Groove Diameter	Groove Width	Radial Clearance $S_{max.}$			
	Standard Range	Extended Range	h	D_1 H9	L_1 +0.2	2 MPa	10 MPa	20 MPa	40 MPa
RVC0	3 - 9.9	3 - 40	1.45	d_N / d_1 + 2.9	2.4	0.20	0.10	0.08	0.05
RVC1	10 - 19.9	6 - 200	2.25	d_N / d_1 + 4.5	3.6	0.25	0.15	0.10	0.07
RVC2	20 - 39.9	10 - 400	3.10	d_N / d_1 + 6.2	4.8	0.35	0.20	0.15	0.08
RVC3	40 - 119.9	20 - 700	4.70	d_N / d_1 + 9.4	7.1	0.50	0.25	0.20	0.10
RVC4	120 - 999.9	35 - 1,600	6.10	d_N / d_1+ 12.2	9.5	0.60	0.30	0.25	0.12
RVC5	1,000 - 2,500	80 - 2,500	9.50	d_N / d_1 + 19.0	15.0	0.90	0.50	0.40	0.20

ORDERING EXAMPLE

Turcon® Variseal® M2S, recommended range:

Series:	RVC3 from Table 183
Rod Diameter:	D_N = 80.0 mm
TSS Part No.:	RVC300800 from Table 184
Spring Material:	Stainless steel from Table 180
Spring Load:	Medium

For other seal and spring materials please contact the Trelleborg Sealing Solutions representative.



* For diameters ≥ 1,000.0 mm multiply only by factor 1.
Example: RVC5 for diameter 1,200.0 mm
TSS Article No.: RVC5**X1200** - T40SM

Table 184: Installation Dimensions / TSS Part No.

d_N	D_1	TSS Part No.
3.0	**5.9**	**RVC0_0030**
4.0	**6.9**	**RVC0_0040**
5.0	**7.9**	**RVC0_0050**
6.0	**8.9**	**RVC0_0060**
8.0	**10.9**	**RVC0_0080**
10.0	**14.5**	**RVC1_0100**
12.0	**16.5**	**RVC1_0120**
14.0	**18.5**	**RVC1_0140**
15.0	**19.5**	**RVC1_0150**
16.0	**20.5**	**RVC1_0160**
18.0	**22.5**	**RVC1_0180**
20.0	**26.2**	**RVC2_0200**
22.0	**28.2**	**RVC2_0220**
25.0	**31.2**	**RVC2_0250**
28.0	**34.2**	**RVC2_0280**
30.0	36.2	RVC2_0300
32.0	**38.2**	**RVC2_0320**
35.0	41.2	RVC2_0350
36.0	**42.2**	**RVC2_0360**
40.0	**49.4**	**RVC3_0400**
42.0	51.4	RVC3_0420
45.0	**54.4**	**RVC3_0450**
48.0	57.4	RVC3_0480
50.0	**59.4**	**RVC3_0500**
52.0	61.4	RVC3_0520
55.0	64.4	RVC3_0550
56.0	**65.4**	**RVC3_0560**
60.0	69.4	RVC3_0600
63.0	**72.4**	**RVC3_0630**
65.0	74.4	RVC3_0650
70.0	**79.4**	**RVC3_0700**
75.0	84.4	RVC3_0750
80.0	**89.4**	**RVC3_0800**
85.0	94.4	RVC3_0850
90.0	**99.4**	**RVC3_0900**
95.0	104.4	RVC3_0950
100.0	**109.4**	**RVC3_1000**
105.0	114.4	RVC3_1050
110.0	**119.4**	**RVC3_1100**
115.0	124.4	RVC3_1150
120.0	132.2	RVC4_1200
125.0	**137.2**	**RVC4_1250**
130.0	142.2	RVC4_1300
135.0	147.2	RVC4_1350
140.0	**152.2**	**RVC4_1400**

Rod diameters in **bold** type correspond to the recommendations of ISO 3320.

For additional size and part number details please contact your local Customer Solution Center.

Additonal Scrapers

Available upon Request

Old Series

Special Series

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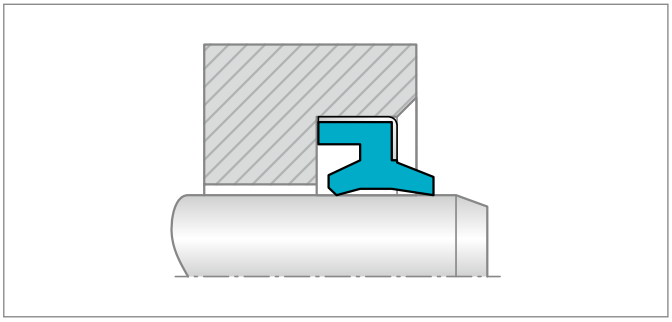
POLYPAC® UWR/PC

The UWR/PC is double-acting polyurethane wiper with integrated metal reinforcement for open groove assembly. The double lip guarantees a reliable scraper effect in one side and the sealing function of the oil film on the other.

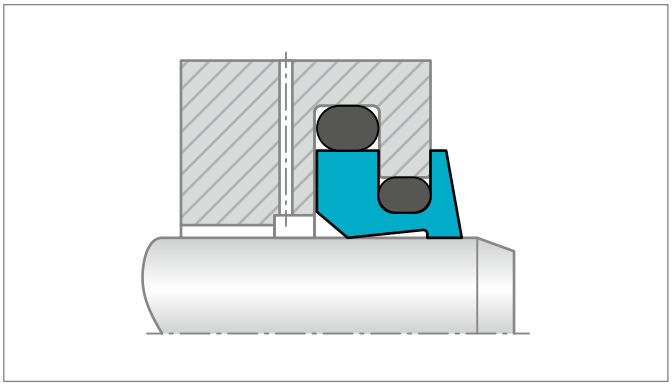
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
35 - 150	-	-35 to +100	Up to 0.5



TURCON® EXCLUDER® G

A double-acting scraper with two different scraper lips which are positioned back-to-back. The scraper is installed with two O-Rings as elastic energizing elements. It is used in medium to heavy-duty applications where a gap between the rod and the gland in front of the Excluder® is not wanted.
Standard TSS Part Numbers are available (WEG).

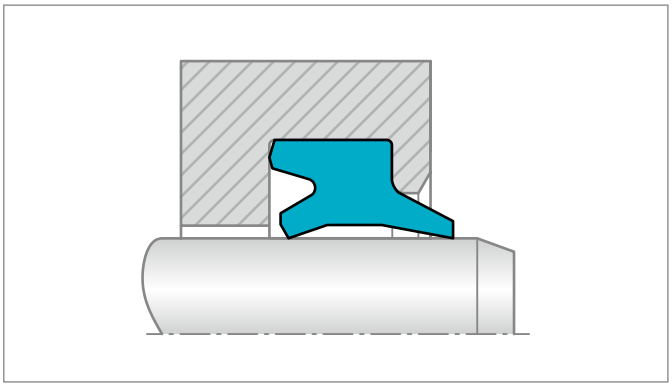
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
100 - 999	-	-45 to +200	Up to 5



SCRAPER DA27

The scraper DA27 is a moulded double-acting elastomer scraper. It has two geometrically different scraper lips. The scraper is preferably used for reciprocating piston rods and plunger pistons in large hydraulic cylinders. It prevents the penetration of dirt into the system and on the medium side holds back the residual oil film from the extending piston rod.

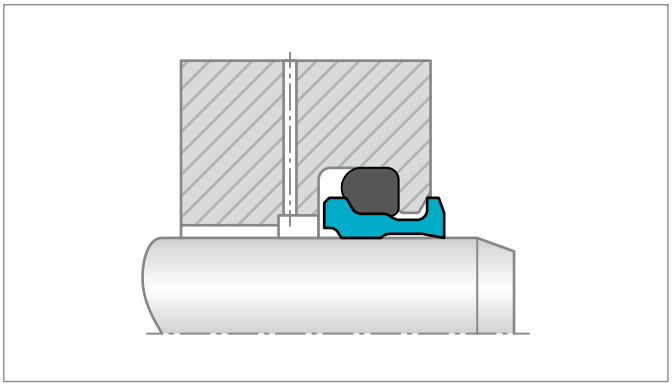
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
400 - 1,300	-	-30 to +100	Up to 1



SHIELD EXCLUDER

A double-acting scraper with optional pressure relief function, which is axially and radially pre-tensioned by an elastic O-Ring. Special features include a pre-stressed scraper shield, a second scraper edge and almost constant contact pressure even at large deflections. Used for medium- to heavy-duty applications in dirty environments.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
30 - 300	-	-45 to +200	Up to 2



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